JANUARY, 1938

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YEARBOOK
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EXPOSITION
NUMBER

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Fifty years ago—

In New York City, an impetuous youth named Theodore Roosevelt ran third in the mayoralty election . . . the Brooklyn Bridge was the newest wonder of the world . . . and 45th and Vanderbilt Avenue was in the center of "Shanty Town".

In Chicago, a populace, alarmed by labor troubles which culminated in the Haymarket bomb explosion, set on foot a movement for the establishment of a large army post for the protection of the city and quickly raised $500,000 to buy the site of Fort Sheridan.

In Boston, John L. Sullivan was heavyweight champion of the world.

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In Philadelphia, Eighth and Walnut Streets was the center of the city . . . George W. Childs and Anthony J. Drexel, owners of the Public Ledger, broke with the Democratic Party over the Free Trade issue.

In Tulsa, Oklahoma—there was no Tulsa, Oklahoma!

In Washington, Grover Cleveland was President of the United States . . . the proposed establishment of a Federal Department of Agriculture was called dangerous class legislation . . . there was an embarrassing annual surplus in the accounts of the U. S. Treasury!

In 1888,—fifty years ago—Warren Webster & Company started business in a small building where the first Webster Feed-Water Heaters and Webster Vacuum Systems of Steam Heating were manufactured.

Original Plant of Warren Webster & Company where the first Webster Vacuum Feed-Water Heaters and Webster Vacuum Systems of Steam Heating were manufactured.

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TODAY—fifty years after that modest beginning in 1888—Webster is the best known name in steam heating. Webster's position in the Heating Industry today is the result of fifty years of constant progress plus the work of a national organization of steam heating specialists in securing correct application of steam heating systems in more than 70,000 buildings.

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HEATING & VENTILATING, *formerly* HEATING & VENTILATING MAGAZINE, published monthly by THE INDUSTRIAL PRESS, 148 Lafayette Street, New York, N. Y. Subscription rates: United States, $2.00; Canada, $2.50: Foreign, $3.00. Single copies, 30 cents. Vol. 35, No. 1, January, 1938. Entered as second-class matter, April 18, 1925, at the Post Office at New York, N. Y., under the Act of March 3, 1879.

The Prospects for Building in 1938

By
L. Seth Schnitman
Consulting Economist

TAKING into account the prospects for both new building construction and modernization work for 1938 it seems safe to forecast that the total dollar volume will be more than 10% below the 1937 figures. On this basis 1938 promises a total dollar volume which will exceed $2,100,000,000† by a good margin. And this estimate does not include heavy civil engineering construction, such as highways, bridges, dams, and the like. There is, of course, nothing of the spectacular about the size of this forecasted volume, which includes public and private, residential and non-residential structures. Yet in these days of extreme uncertainty in other sectors of the economy, as well as on the building front itself, surely any program that involves over two billions in expenditures cannot be dismissed lightly.

In order to make clear the basis for this forecasted volume let us examine respectively the prospects for new building construction and for modernization work in which heating and ventilating equipment may be expected to find a market in 1938. In doing so it is well to keep in mind that the most frequently used statistical series are largely confined to new building projects while statistics on the volume of modernization work on buildings are relatively new and not very complete.

If we consider only the area customarily reported upon by F. W. Dodge Corporation on the so-called contract award basis—the 37 states east of the Rocky Mountains—the 1938 building volume, new and alterations, will exceed $1,750,000,000. And even this is a total large enough to be of special significance to all interested directly in the building field, if not indeed to every one at all concerned with the outlook for general business.

Regardless whether the estimate for the entire country be used or whether the estimate be confined only to the 37 Eastern states, the new building volume in dollars is destined to show a shrinkage from the 1937 performance. Yet the drop will not be large, probably less than 15%. It should be reassuring, too, to know that new building in 1938 will prove out at worst only little below what it was in 1936 and considerably better than for 1935, barring some unpredictable catastrophe, such as war. And it even may be written large that, wild inflation excepted, the current upward phase of the new building cycle still has some considerable distance to go irrespective of what happens during 1938, if only some of the political hurdles can be levelled.

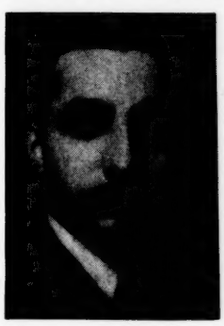
For modernization, i.e., alterations, additions, and repairs, the 1938 volume will very probably exceed the 1937 total by perhaps as much as 10%. This now appears very definitely indicated by the resumption of insurance on modernization loans under amendments to the National Housing Act which are certain to pass Congress. For the 30-month period ended December 31, 1936, the Federal Housing Administration insured building modernization loans in the amount of about a half billion dollars. This possibly represented no more than one-third the total volume of building alterations and repairs that was actually done during the same period. Of the total amount of insured modernization loans, 74% was for residential improvements and 26% for non-residential work. And in this connection it is of much interest to note also that of this total volume of all modernization work undertaken under the FHA plan, 60% represented additions and repairs while the remaining 40% went into machinery and other equipment items. It should also be pointed out that insurance on these underwritten modernization loans extended only to 20% of the total amount of credit advanced by lending institutions, and that the credit experience was excellent when considered from the viewpoint that about 1,325,000 individual loans were insured under the plan until Title I of the Housing Act was permitted to lapse.

Major fluctuations in building activity rest upon the following factors: Construction costs, rental indexes, the national income, interest rates, availability of mortgage money, and population growth, to say nothing of other elements which from time to time play varying roles of importance.

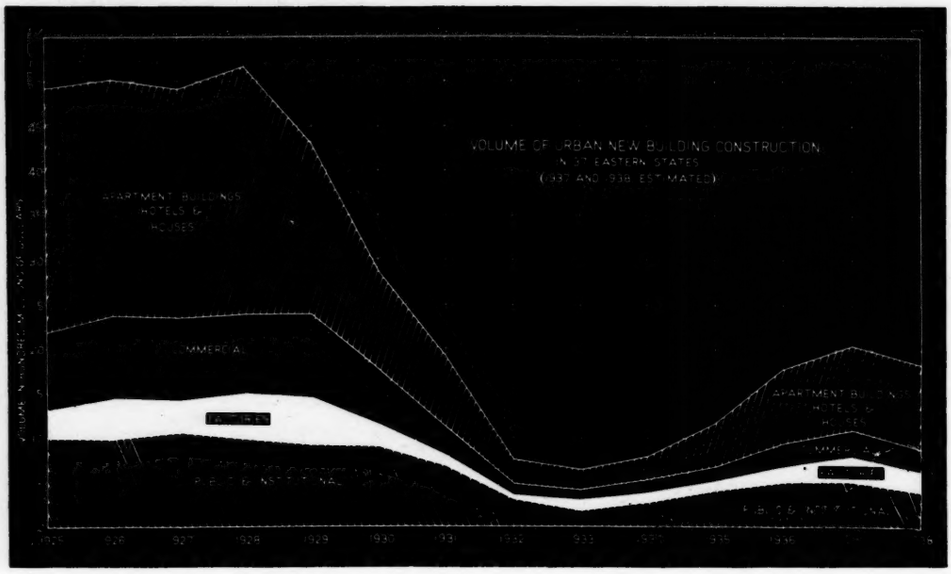
Building costs as an influence of major importance take first place in year-to-year changes in new building volume. But over the duration of any building cycle it takes more than this item alone to limit the length or amplitude of the new building curve. While building costs are not nearly so important in the timing of industrial building operations as is the trend of manufac-

†Includes estimates for the 11 Rocky Mountain and Pacific Coast states adjusted to the reporting basis followed by F. W. Dodge Corporation covering the 37 eastern states.

Progress in heating, ventilating, and air conditioning is closely related to building activity. A nationally known economist predicts on the basis of past performance that 1938 will see a building volume of over two billion dollars. He also shows where this money will be spent both by region and building type. The author is well qualified. He was formerly Chief of Division of the Department of Commerce, "Survey of Current Business," and more recently Chief Statistician, F. W. Dodge Corporation. Late in 1935 Mr. Schnitman cautioned against the then growing boom psychology as to building prospects. Again, at the end of 1936, he stated "though building improvement will continue into 1937, disappointment awaits those who expect boom conditions."



The Author



turing earnings and earnings prospects, in the housing field the trend of building costs markedly determines the year-to-year fluctuations and ultimately has large place in shaping directional changes of the cycle.

But building costs in no event can be considered separately and apart from the other elements. It is only when they are out of line with the general price level and the index of housing rentals and the state of the national income that the full force of so-called high costs, as it is true today, makes itself felt. For there is no lack of purchasing power but rather an unwillingness by the purchaser to buy and by the builder to build, at the prices asked.

In a very real sense it is this condition that operated during the final half of 1937 to decelerate the relatively high rate of housing construction which held such large promise during the spring season. And in the same sense it is this maladjustment between going building costs, the general price level, the rental index, the national income, and even the status of industrial activity generally, that is now operating to shape the course of new building activity for 1938.

For residential building the 1938 total covering the 37 Eastern states will run some 3 to 5% greater than the $915,000,000 volume estimated to have been reached in 1937. All of the estimated gain for 1938 will likely come from a speed-up in the new public housing program as distinguished from housing to be erected purely by private initiative. And in this latter connection, sight has not been lost of the probabilities that some liberalization of the FHA insured mortgage system, as affecting private housing operations, will probably be obtained during the year.

All of the indicated gain in housing for 1938 will likely occur in the final half of the year. It is then that public housing jobs will have passed beyond the blueprint stage. Incidentally, the first half of 1938 promises to show a decline of approximately 20% from the housing volume reported in the 37 Eastern states for the corresponding six months of 1937. In this connection it should be noted that whereas during the 1937 half-year period an appreciable amount of public housing was undertaken under the old PWA program, virtually no public housing will be started much before midyear 1938.

Let us localize here the 1938 prospects for housing by major geographic districts. In the area east of the Rocky Mountains only the New England states appear destined to show a smaller volume than was undertaken during 1937, and even here the decline will probably be less than 10%. The area indicated for the greatest gains embraces the Middle Atlantic states, where the improvement will be less than 10%. It is here that public housing efforts will be largely concentrated, though some gains coming out of public housing projects alone will probably also occur in the East North Central area. For the 11 Western states the 1938 volume will just about equal the 1937 total. For the South Atlantic states a gain of about 5% appears indicated, while the West North Central, the East North Central, and the West South Central states will show virtually no change from 1937 results.

In arriving at these territorial prospects emphasis has been laid upon the outlook for income of the respective areas, upon known facts as to the inventory of unsold houses built by operative builders during 1937, upon the element of public housing, upon the elements of localized building costs and rental tendencies.

Another approach to the residential building prospects for 1938 may be made, this time with reference to the probable distribution as between multiple-family housing and housing in single-family and two-family dwellings. Out of an estimated volume for the 37 Eastern states covering all classes of residential building

VOLUME OF URBAN NEW BUILDING CONSTRUCTION IN THE 37 EASTERN STATES
(Figures in Millions of Dollars)

Year	Grand Total Building	Residential Building	Non-Residential Building			
			Total	Commercial	Factories	Public and Institutional
1925	4,941	2,748	2,193	872	326	995
1926	5,040	2,671	2,369	921	471	977
1927	4,921	2,573	2,348	933	376	1,039
1928	5,163	2,788	2,375	885	509	981
1929	4,292	1,916	2,376	929	546	901
1930	2,859	1,101	1,758	616	256	886
1931	1,921	811	1,110	311	116	683
1932	761	280	481	123	44	314
1933	653	249	404	99	127	178
1934	792	249	543	151	116	276
1935	1,154	479	675	165	109	401
1936	1,755	802	953	249	198	506
1937 Est.	2,025	915	1,110	305	305	500
1938 Est.	1,820	945	875	250	225	400

SOURCE: F. W. Dodge Corporation. 1937 and 1938 estimates are by L. Seth Schnitman. Above figures do not include all low-cost projects, especially in the housing field, nor do they include building projects on the farms within the area covered. For the most part the data represent building jobs undertaken under contract and do not include all projects done by day labor or under so-called force account. While they include some modernization or alteration work, they do not include all such work done.

in the amount of $945,000,000 for 1938, some $240,000,000 will approximate the total expenditures for housing in apartment house types; at least one-third of this amount will be public housing constructed under the auspices of the U. S. Housing Authority. An additional $40,000,000 will represent the volume of expenditures on hotels and dormitory types. Some $640,000,000 will be expended on single-family houses of which about 55% will represent homes built by owners for their own occupancy. The two-family house type will account for about $25,000,000 in 37 Eastern states.

Public housing in the 37 Eastern states, including both so-called low-rental projects for low-income families and army housing, will approximate $100,000,000 in 1938 for a virtual doubling of the 1937 total. Private housing, on the other hand, will show a 1938 total of about $840,000,000 for an indicated loss from the 1937 total of less than 5%.

Some 93,000 new single-family houses will be constructed in the area east of the Rocky Mountains (F. W. Dodge basis of coverage) during 1938. Of this total about 24% will have a construction cost under $4,000 per unit; about 72% will range in cost from $4,000 to $15,000; and the remaining 4% will show a cost range of $15,000 and more per unit.

One thing more: Residential building on the farms in the 37 Eastern states (not reported in Dodge statistics) will in 1938 approximate $65,000,000 additional, while $8,000,000 more appears destined to go into residential buildings on the farms in the 11 Western states.

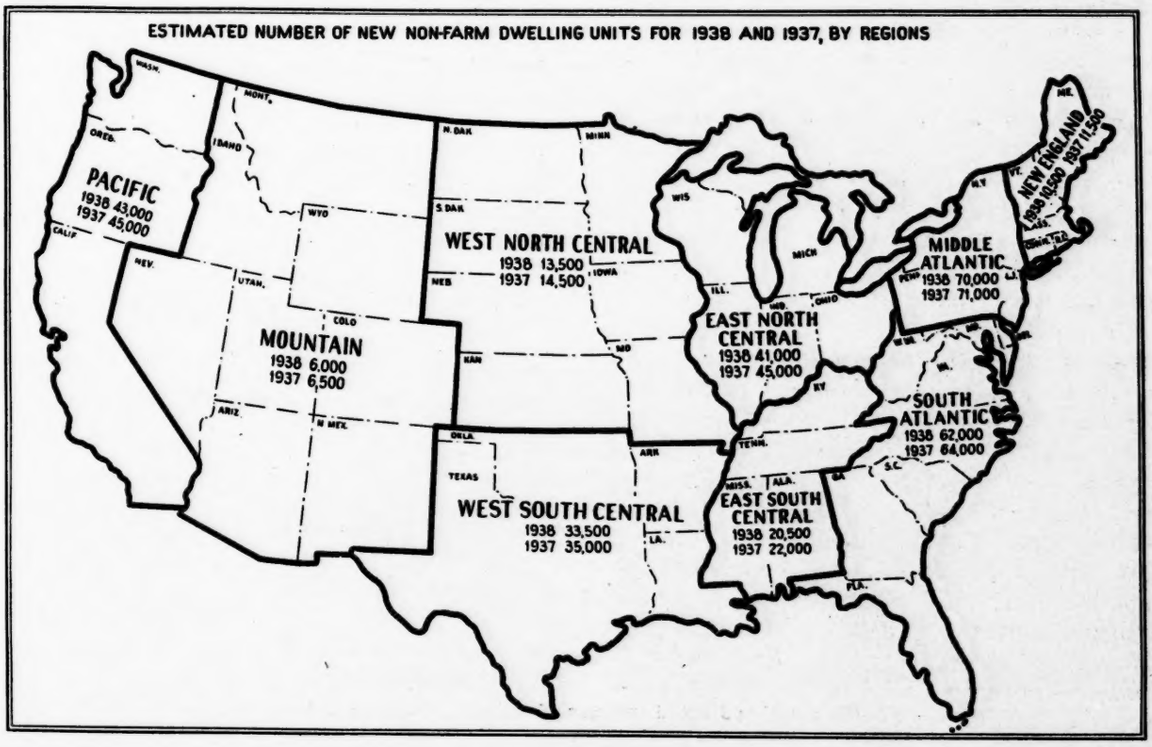
We come now to non-residential building which is customarily a concomitant and not an important motivating force of large general construction activity. Surely it does not hold the significance in this respect that is true of the residential building field. For the year 1937, non-residential building represented about 55% of the total volume of building in the 37 Eastern states exclusive of civil engineering, while residential building represented the remaining 45% of the total building volume in this area. On this basis non-residential building would appear as the more important, but being further removed from the consumer, the non-residential building dollar generates far less consumer purchasing power than does the residential dollar.

Non-residential building divides itself quite naturally into three broad divisions: Commercial, factory, and public and institutional types. This latter category embraces educational buildings, hospitals, institutions, public buildings of every description, religious and memorial buildings, and recreational facilities, many of which are financed from public funds.

Better than 30% of the total of all non-residential buildings in 1937 according to records of F. W. Dodge Corporation covering the 37 Eastern states were publicly financed. And this percentage should be approximated for 1938.

For all classes of non-residential building, on the Dodge basis of coverage, the 1938 volume will be not far from $875,000,000. This represents an indicated shrinkage of approximately 20% from the estimated total of $1,110,000,000 for 1937. Each quarter of 1938 will show losses from the totals for the corresponding quarters of 1937, with the greatest percentages of loss probably centering in the second and third quarters.

For commercial building alone, including large modernization jobs, the 1938 volume in the 37 Eastern states will approximate $250,000,000 for an indicated decline of approximately 15% from the 1937 results. The commercial building classification includes garages and service stations, banks, office buildings, stores and commercial warehouses. During 1937 retail trade was on a relatively high plane and store construction, which accounted for almost half of the total volume of commercial building, registered a gain of better than 25% over the 1936 figure. Though the outlook for retail trade is still relatively good, current unsettlement in industry is operating to dampen the prospects for store building in 1938. Store modernization, on the other



ESTIMATED NUMBER OF NEW NON-FARM DWELLING UNITS†

Geographic District	1938	1937
New England	10,500	11,500
Middle Atlantic	70,000	71,000
East North Central	41,000	45,000
West North Central	13,500	14,500
South Atlantic	62,000	64,500
East South Central	20,500	22,000
West South Central	33,500	35,000
Mountain	6,000	6,500
Pacific	43,000	45,000
Total United States	300,000	315,000

†These figures are estimates extending the series of Messrs. Wickens and Foster of the National Bureau of Economic Research as drawn from figures on building permits from the U. S. Department of Labor. They cover all non-farm housing construction, both urban and rural in all types, from the single-family house to the apartment house type; regardless of the type of structure, each accommodation for a single family is counted as a dwelling unit. These figures are considerably larger than the data based on the Dodge method of coverage even in the 37 Eastern states, the chief difference being in the fact that the above figures include estimates for the low-cost projects not covered by F. W. Dodge Corporation statistics. Estimates are by L. Seth Schnitman, through courtesy of International Statistical Bureau, Inc.

hand, should continue on a fairly high plane with the result that total volume of store building, new and alteration, appears destined to show relatively minor shrinkage under the 1937 figure.

Commercial warehouses in 1937 will account for roughly one-sixth of the commercial building volume. But the occupancy ratio in public warehouses and the current adverse turn in industrial production indicate a shrinkage of better than 20% in this type of construction from the figure of approximately $55,000,000 reported by F. W. Dodge Corporation for 1937.

Commercial garages and service stations showed a building volume for 1937 which was about one-third greater than the 1936 total. But correlation of garages and service stations with automobile production, gasoline consumption, bank debits, and industrial production indicates a probable decline in this type of building operations in 1938 in excess of 15%. Correlations with stock market activity, bank debits and commercial failures lead to the conclusion that office building construction in 1938 will likewise show a decline of no less than 15% from the 1937 results, but office building modernization will probably suffer no material shrinkage.

We come now to factory building. The year 1937, by comparison with recent years, was an exceptionally good one insofar as this field of building is concerned. In the 37 Eastern states factory building in 1937 approximated $300,000,000 and this excludes equipment items. Four classes of factories, those manufacturing foods, iron and steel, automotive vehicles, and paper and pulp accounted for no less than 50% of the dollar total of factory building operations during the year. Independent correlation for each of these four classes of factory building with steel production and general industrial activity brings the conclusion that the four groups combined will show a loss in building volume for 1938 of no less than 25%, with a loss at least as large in textile factory building.

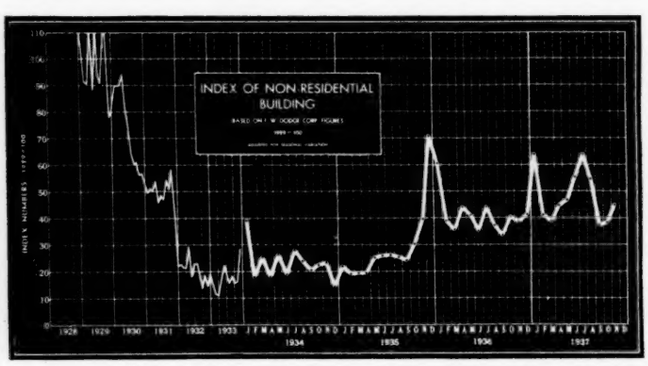
All together, a figure of $225,000,000 appears as the probable volume for factory building for 1938 in the 37 Eastern states, exclusive of equipment. No consideration of the factory building outlook could be complete without some comment on the capital market, especially as relates to funds available for plant expansion and modernization. The 1937 volume of new capital issues for non-refunding purposes was roughly 10% lower than the 1936 total. Without drastic change in the undistributed profits tax, the capital gains tax, and even the restrictive regulations of the Securities Exchange Commission which have made the security markets so thin, no important increase in capital flotations can be expected to occur in time to improve the 1938 factory building outlook.

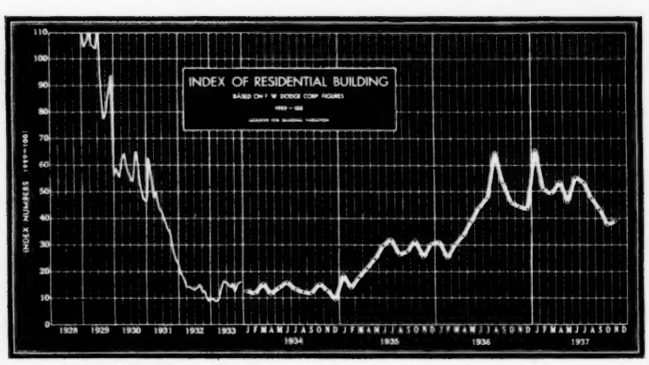
Now as to public and institutional types: Educational building, because of retrenchment in spending by public agencies, will show a decline of approximately 15% from the figure of about $200,000,000 shown in 1937 for this class of building operations in the 37 Eastern states. Incidentally, the current recession in business is not conducive to building operations on the part of private schools and colleges operating on endowment funds, nor to gifts for college plant extensions.

Hospital and institutional building operations for 1938 will show a decline of approximately 15% from the figure of about $75,000,000 shown for this class of work in the 37 Eastern states for 1937.

Because of general retrenchment in Federal public spending, a shrinkage in administrative public building from the 1937 total of approximately $100,000,000 appears definite for 1938. This loss will be in excess of 10%. Incidentally, this class of work in 1937 failed, by a fractional amount, to meet the level reported for 1936.

For religious, memorial, social and recreational structures the 1938 combined volume will be about 10% smaller than the 1937 combined figure for these classes in the amount of about $115,000,000. Adding this all up, public and institutional building of all types in the 37 Eastern states during 1938 will approximate $400,000,000 as against about $500,000,000 for 1937.





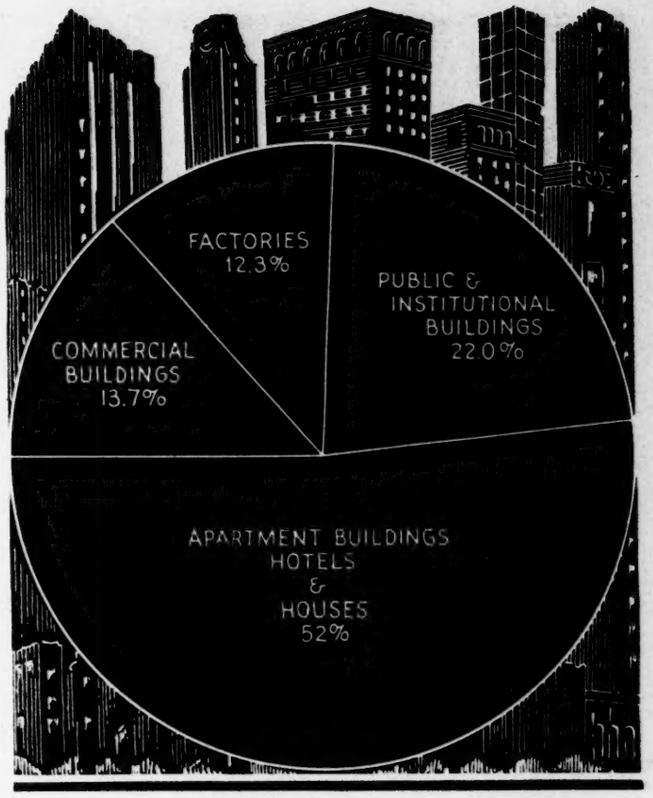
Seasonally-adjusted indexes of building (1929 = 100)

Non-residential building as a whole for 1938, on the basis of Dodge figures, will show a volume of approximately $250,000,000 for the Middle Atlantic states, this as compared with a total of about $310,000,000 for 1937. In the East North Central states, the 1938 volume of non-residential building will approximate $225,000,000, representing a shrinkage from the 1937 figure of about $300,000,000, approximating 25%. These two areas are closely identified with the automotive field and related industries for which the 1938 outlook is not especially promising. The South Atlantic area in 1938 likewise is destined for a material loss from its 1937 figure of about $190,000,000; the decline here will probably exceed 20%. In approaching the prospects for this district large weight was given to the fact that in 1937 a substantial proportion of the total volume of non-residential building for this area represented paper and pulp mills, textile mills, and public building, for which the 1938 prospects are not particularly bright. All other important geographic areas are estimated to show losses in non-residential building in 1938, but these will be much more moderate than those indicated for the Middle Atlantic, the East North Central, and the South Atlantic areas.

Since so much has been made, and not without reason, of the fact that construction costs have stifled building recovery, let us here consider in some detail the 1938 prospects on this front. Taking the year as a whole, building costs will probably average from 5 to 10% lower than the average for 1937. This will be due as much to declines in materials as to lower real wage payments to building labor. Under ordinary conditions such a decline in costs could bring in an appreciable rise in building volume, provided rentals either remained firm or exhibited a rising tendency. That this situation will exist as to rentals remains dubious unless the current recession in business and industry quickly runs its course.

It will probably be midyear before industrial activity will have attained to a level high enough to encourage resumption of the forward movement in private building. And this must occur before balance between construction costs, rentals, and the national income can be restored to provide the natural setting for recovery.

Much depends, too, upon the speed with which Government and industry and labor will resolve the problems now pressing for solution — problems of labor strife, of high taxes, of high material prices, to name only a few. For unless these problems are quickly resolved, Government once again may be compelled by the pressures of mounting relief needs to undertake another excursion in the field of "pump-priming," with repercussions much less tasteful than the last.



How the 1938 building dollar will be apportioned

Whether Government embarks on a new spending program or not, building volume in 1938 will be not far below the 1937 total, with a small residential building improvement partially offsetting a rather drastic loss in non-residential building.

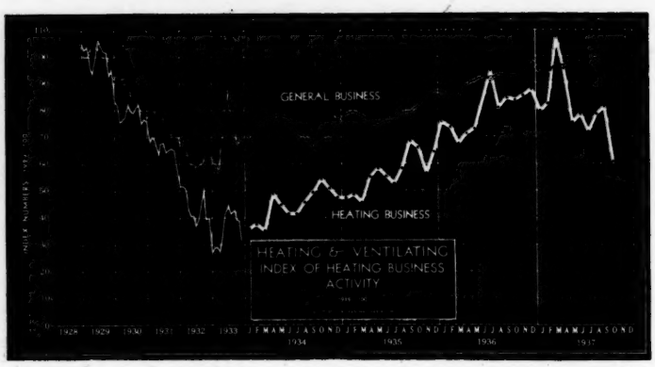
Just one look into the further future. For the 37 Eastern states the building volume, residential and non-residential, will probably reach its maximum expansion after the turn of the current decade. But it is unlikely that the coming peak of the current building cycle will attain to the boom proportions of the last cycle, unless Government itself should unwisely decide to take over the job of making the building industry carry the full load of industrial recovery.

Lest we forget, our population growth rate is now cut by more than half. This factor, coupled with the changing age distribution of our existing population, is slowly but nonetheless profoundly affecting the destiny of the building industry. Until we find a way of improving the housing standards of the people, preferably by the exercise of our characteristic private initiative, and at costs which the masses can afford to pay, this factor of declining population growth rate will continue to limit forcibly the amplitude of ensuing building cycles. For now it should be clear, out of the lessons of the depression, that we must not again revert to the flimsy system of guaranteed mortgage bonds and certificates that helped to make the last boom possible.

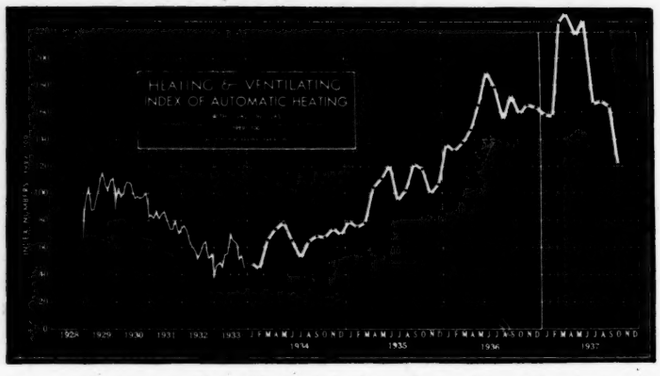
ESTIMATED VOLUME OF PRIVATE NEW BUILDING CONSTRUCTION IN THE UNITED STATES†
(Exclusive of Utilities. Figures are in Millions of Dollars)

1925	$6,187
1926	6,396
1927	6,395
1928	6,560
1929	5,402
1930	3,012
1931	1,954
1932	711
1933	707
1934	808
1935	1,194
1936	1,903
1937 (Est.)	2,450
1938 (Est.)	2,150

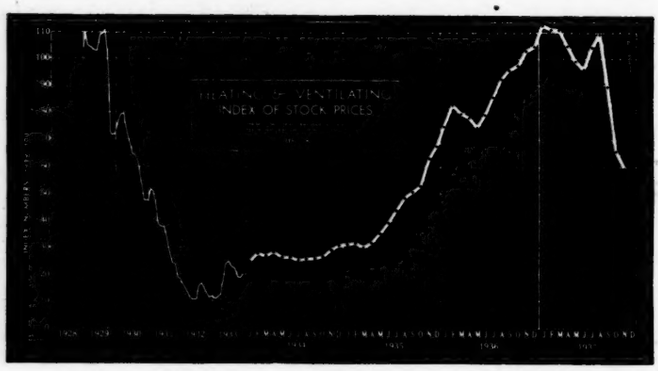
†Figures from 1925 through 1936 from the report by Peter A. Stone of the Works Progress Administration. Estimates for 1937 and 1938 by L. Seth Schnitman, through courtesy of International Statistical Bureau, Inc. Figures include some modernization or alteration work but not all such work done.



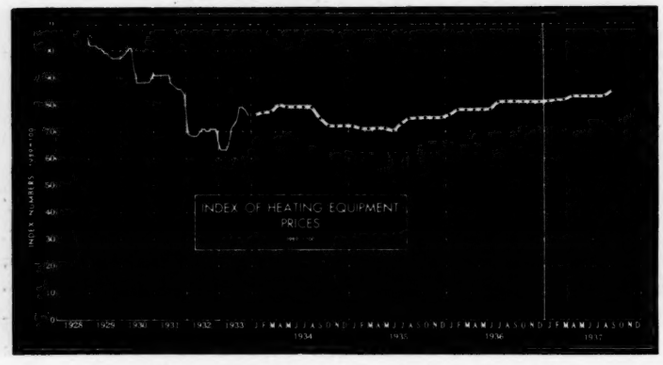
1 Trend of industrial and merchandising activity as compared with heating business activity. Both indexes are seasonally adjusted. The heating curve does not include summer air conditioning. 1929 = 100.



2 A seasonally adjusted index of combined business in oil burners (conversion burners, boiler-burner units, and furnace-burner units), heating stokers, and central gas burning equipment. 1929 = 100.



3 Trend of common stock prices of 11 industrial firms, most but not all manufacturing nothing but heating and air conditioning equipment. Index is not seasonally adjusted; 1929 = 100.



4 Trend of prices of some few items of heating equipment—round boilers, sectional boilers and radiators. The index is that of the U. S. Bureau of Labor Statistics converted to a 1929 = 100 base.

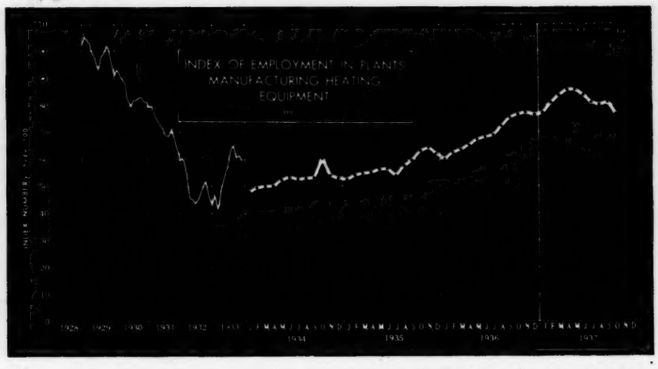
MONTHLY INDEXES

ON this page is presented a collection of important monthly indexes—which, since they are plotted by months, are sensitive to the advances and recessions throughout the years.

It should be emphasized that both Charts 1 and 2 are adjusted for seasonal variation and consequently eliminate entirely the usual fall peaks and spring valleys. The others are not adjusted since there is no marked seasonal trend in these series.

All of these charts are plotted in terms of index numbers with 1929 as 100. This means merely that the average for 1929 is considered as 100% and activity or occurrences in succeeding months are shown in per cent of this 1929 average.

Of special interest is the fact that for two months in 1937 the heating business curve reached 1929 levels (a prediction made on these pages a year ago); that automatic heating is far above 1929 levels but with rather precipitous drops the last few months of 1937; the sharp decline in stock prices of manufacturing companies in the heating and air conditioning industry starting in September; the gradual increase of prices of heating equipment in the fall of 1937 and the slow but nevertheless prominently marked drop-off in factory employment since last spring.



5 The trend of employment in industrial plants making heating apparatus and steamfittings. The curve is based on the U. S. Bureau of Labor Statistics index, converted to a 1929 = 100 base.

A Look at the Record for 1937

WHILE 1938 promises to be a year whose total volume will be much like that of last year, the competition for a share of this volume will continue unabated. Almost never do changes take place suddenly which result in shifting any one method or any one type of equipment out of the picture. Instead, changes come gradually. Consequently it is desirable to have a record of the recent trends in order to judge both the present situation and to appraise the future. On this and the next few succeeding pages are presented a series of charts to show what has happened to many of the important equipment groups during a nine-year period ending at the opening of 1938.

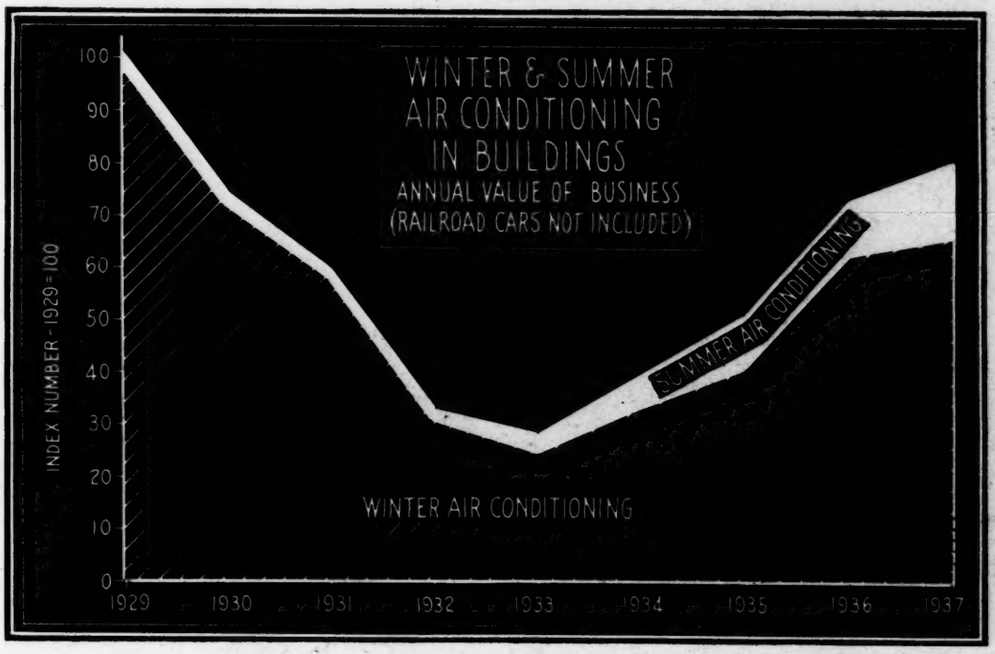
The first of these, presented below, showing how the volume of annual business available to the heating, ventilating, and air conditioning industry has shifted should be full of interest to everyone. Between 1929 and 1932 the value of summer plants installed annually remained about steady while the composite curve was falling rapidly. Then beginning with 1933 both components began to increase.

Since the graph is plotted on index numbers with 1929 at 100, percentages of the 1929 figures for any year can be read directly from the curves. In 1929 the value of the summer plants was about 3% of the total while by 1937 this figure had increased to nearly 20%. In the years before 1932 most of the summer equipment went into new buildings while since that time a considerable part of it has gone into existing buildings.

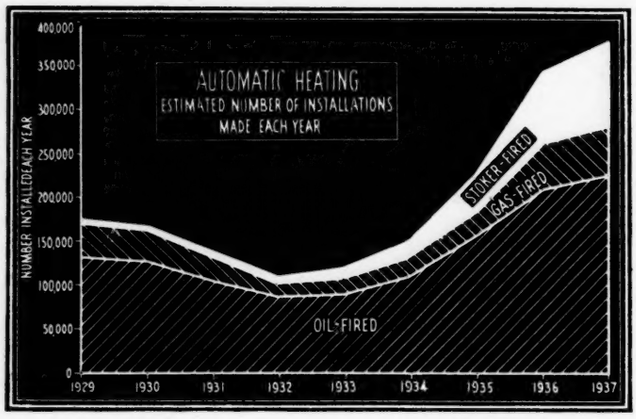
Taking the low point of the curve in 1933 as the base of comparing the trend lines, it will be found that the value of the summer plants installed in 1937 was 3.75 times the value of those installed in 1933. On the same basis the value of the winter plants installed in 1937 was 2.6 times the value of those installed in 1933.

The graph also illustrates strikingly the steady increase in the value of summer and year-round air conditioning plants installed each year, and shows how this value shapes up as a fraction of the total. It also shows that regardless of the progress made to date, it is still true that the value of the winter plants was over four times that of the summer and year-round plants combined during 1937. It is not anticipated that any striking change in the ratio will take place during 1938.

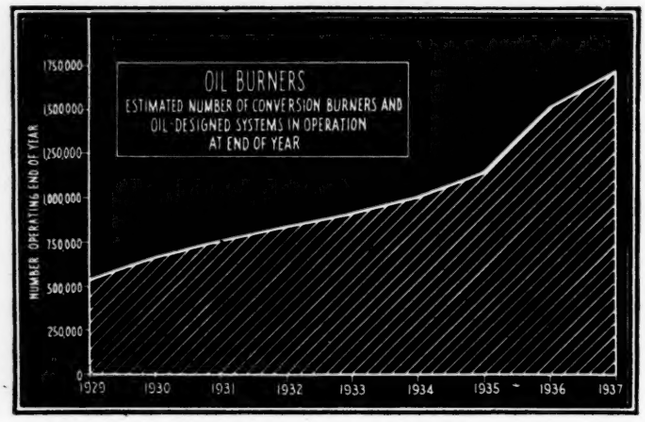
This graph shows as good a simple picture as is possible of the overall situation regarding the dollar value of all the business available year by year to the whole heating, ventilating, and air conditioning industry over the nine-year period. It does not show what has happened to various types of equipment during this same period, as attempts to show these facts in one chart would be too confusing. Similar charts on the next pages, especially, and elsewhere in this issue, present the facts as they apply to individual types of equipment.



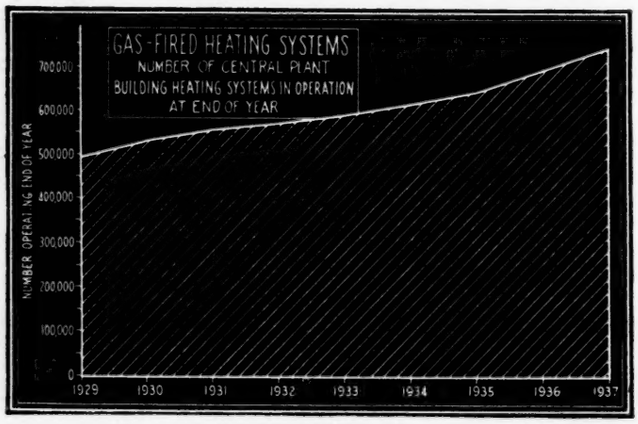
6 **The combined trend of summer and winter air conditioning. The fluctuations in the winter air conditioning are based on the annual variations of HEATING & VENTILATING's Index of Heating Business Activity, while those in summer air conditioning are based on reports from electric utility companies.**



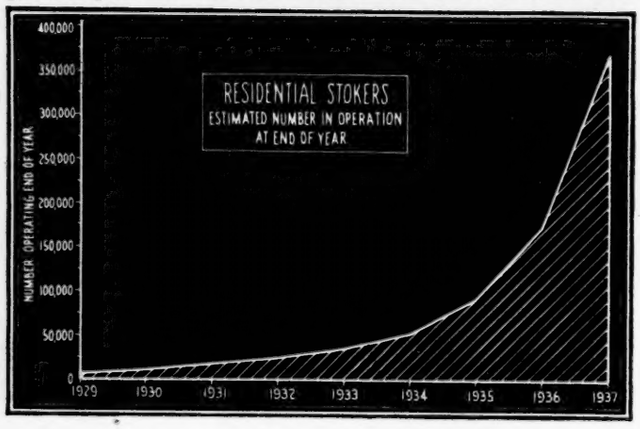
7 **Trend of the annual number of installations of heating stokers, gas-fired central heating equipment, and oil burning central heating equipment.**



8 **Estimated number of oil burners operating in the U. S. at the end of each year for the heating of buildings. Allowance is made for burners removed.**



9 **Estimated number of central type gas heating plants operating at the end of each year, including gas designed boilers and furnaces and conversion burners.**



AUTOMATIC HEATING

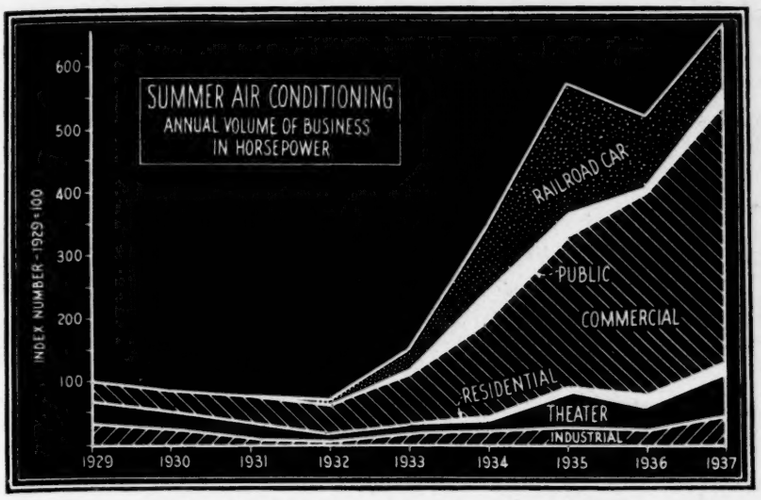
THE battle among the three fuels for their places in the heating business has gone on for a long period. Here are important facts to show their relative positions at the beginning of 1938 and also to note where they have stood over a nine-year period. Whereas in 1929 oil burners were in a strongly dominant position and accounted for nearly 77% of the number of automatic installations made that year, by the opening of 1938 they were accounting for 60% of the 1937 installations. More oil burners were installed in 1937 than during any previous year, but the onrush of the stoker was making itself felt in the comparative picture.

The upper graph shows quite definitely that the rise of the stoker and the increase in the use of gas are not at the expense of the oil burner, but that all three are finding their place in a rapidly expanding total market. All of them are to some extent doubtlessly contracting the market formerly served by coal prepared for hand-firing.

The three lower graphs show the rate of progress made by each of the automatic fuel groups. Both oil and gas were used in approximately 500,000 plants in 1929 while but very few heating stokers were operating at that time. In the nine-year period the number of oil burners operating has increased to about 1,600,000, a net increase of 1,100,000 or an average increase of over 120,000 burners per year. At the same time the number of gas-fired central plants has increased to nearly 750,000, a gain of 250,000, or an average increase of nearly 28,000 burners per year. Both have enjoyed a fairly steady rate of growth each year throughout the period. On the contrary, the rise of stokers from nowhere in 1929 to over 350,000 in operation at the beginning of 1938 has been continually accelerated. In each of the past three years more stokers than central gas installations have been reported. In 1937 nearly 100,000 stokers are reported to have been sold.

In interpreting these facts it should be kept clearly in mind that the picture is incomplete. The graphs do not show the *fuel* situation as a whole; only that part of it in which the fuels are burned centrally under automatic control. When the whole heating fuel situation is considered it will be found that coal is still by far the most generally used fuel for the purpose.

10 **Estimated number of residential heating stokers operating at the end of each year, including both anthracite and bituminous burning units.**



11 **An analysis of the trends of summer air conditioning in different types of buildings and in railroad cars for recent years. Figures are based on reports by large electric utilities and adjusted to estimate the total volume throughout the country.**

SUMMER AIR CONDITIONING

MANY interesting and important facts covering summer air conditioning are shown graphically in Chart 11. The bulge in the volume of this equipment finding its way into public buildings during 1934 and 1935 when the huge Washington buildings were being cooled is clearly shown. So also is the great spurt in railroad car cooling which took place in 1935. The slow growth and present insignificance of the volume of this equipment which goes into residences is also clear. So also is the phenomenal increase in the amount of summer cooling equipment which is being installed in commercial buildings of all kinds.

During 1937 both the theater and industrial fields reversed their trends of the year before and showed more volume than during 1936 and each shows more volume than in any other year during the nine-year period illustrated. The non-residence applications account for nearly 99.5% of the volume in 1937 while the residence applications account for just over ½ of 1% of the volume. If only the equipment going into buildings is considered, then the residence market accounted for ⅝ of 1% of the total volume, while commercial installations accounted for 72% of the total.

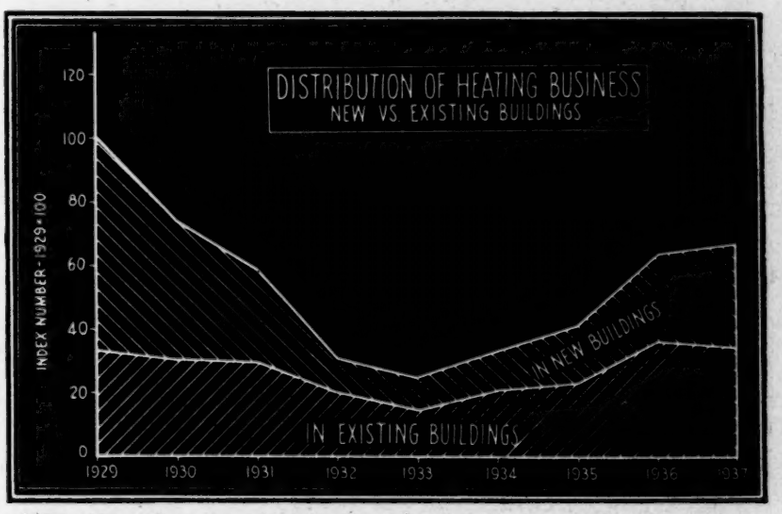
The chart also shows clearly the enormous growth of summer air conditioning over the period from 1929 to the beginning of 1938 during which the dollar volume expanded to a point where the 1937 volume was over six times that of 1929.

In interpreting the chart be sure to allow for the fact that the data include only installations in the United States and do not include equipment sold for export.

HEATING BUSINESS IN NEW AND OLD BUILDINGS

A LARGE part of the heating equipment installed each year goes into existing buildings for repairs, for replacement, or for modernization. The repair and replacement part of this total is believed to be sensibly steady from year to year unless disturbed by most unusual circumstances. The modernization part of the total, however, may vary considerably from year to year and depends to some extent on the sales appeal of the equipment offered, the rate of progress of the art, and on many other factors. Chart 12 shows that over a nine-year period the proportion of the total heating equipment which has gone into existing buildings for all purposes has varied between about 30% in 1929 when new construction was active, and over 60% in 1932 and 1933 when new construction was low. For the past four years it has stood remarkably steady at from 54% to 58% of the total. Over the whole nine-year period illustrated on the chart, appealing modernizing equipment in the form of oil-burners and similar items has undoubtedly swelled the proportionate total over what would otherwise have been expected. So also did the modernization campaigns of 1933 and 1934 undoubtedly add volume to the total.

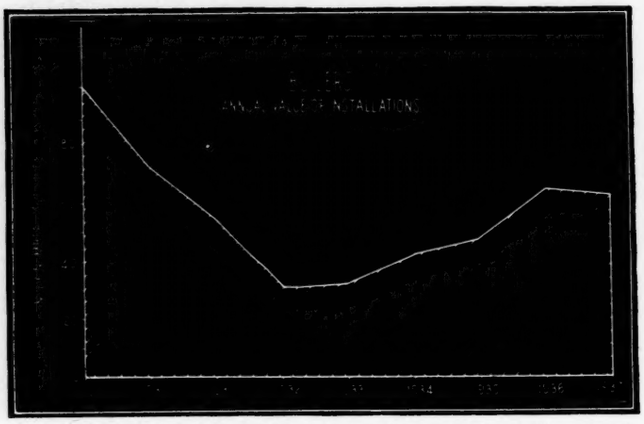
The chart does not include any allowance for the enormous increase in modernization work which has accompanied the recent growth of summer cooling. The reason is that Chart 12 applies only to those equipment items which are commonly used for heating purposes only. Inclusion of the summer figures would change the chart very materially.



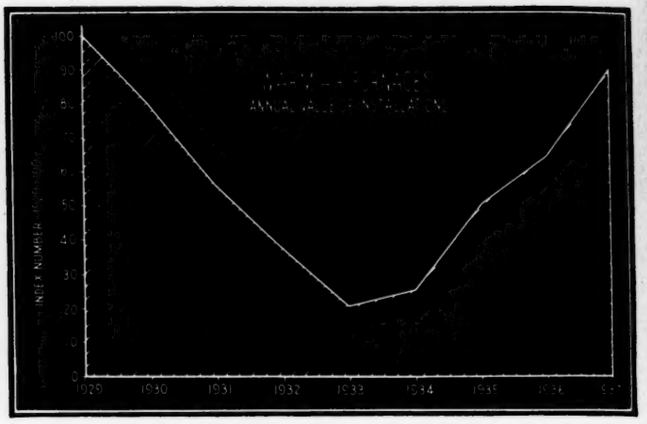
12 **How the sale of heating equipment (not including summer air conditioning) is divided between new buildings and existing buildings. This curve is based on construction census data, new building figures, heating business activity index, and heating equipment price index.**

VALUE OF BUSINESS

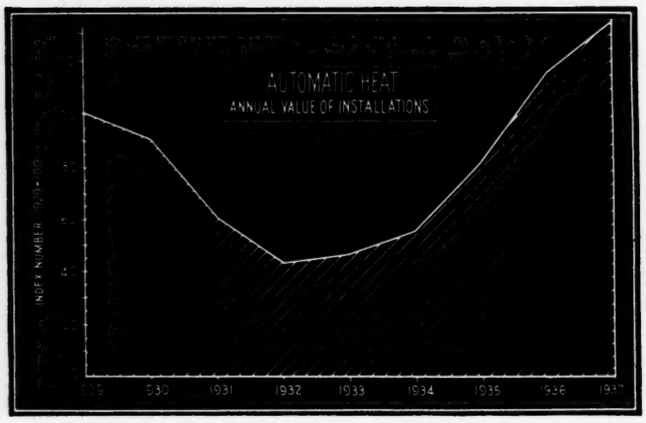
NOT only is it of interest to know the number of installations of various types of equipment made over any period in order to make trends take on meaning, but the annual value is also of interest since in this way price changes are taken into account. By and large, the prices of the equipment used for heating, ventilating, and air conditioning have all fallen in the period from 1929 to 1938. The purchaser now gets more for his dollar than then. All the values shown here are in terms of consumer values with allowances made for all markups and all costs to the consumer up to the time his plant is ready to operate.



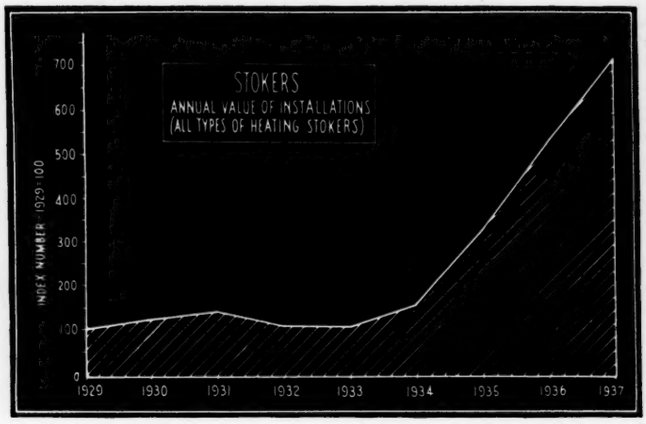
13 An estimate of the total value of the boiler business. This includes oil, gas, steel, and round and sectional cast iron boilers. The estimated value is based on the cost of a boiler installed without connections to the heating system.



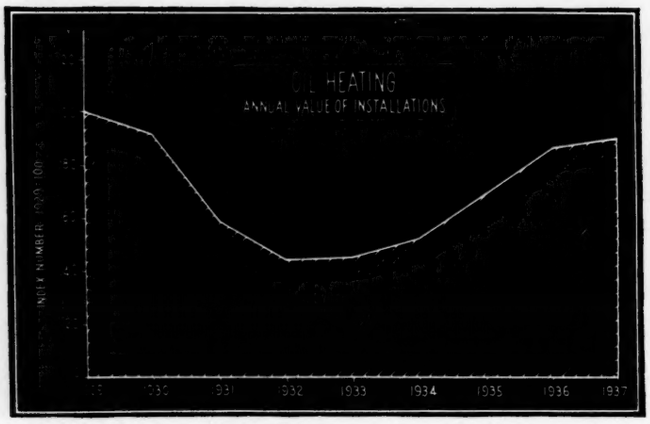
14 An estimate of the total value of the warm air furnace business. Oil and gas furnaces, as well as coal-fired steel and cast iron units, are included. The figures include the installed cost of furnaces exclusive of duct connections.



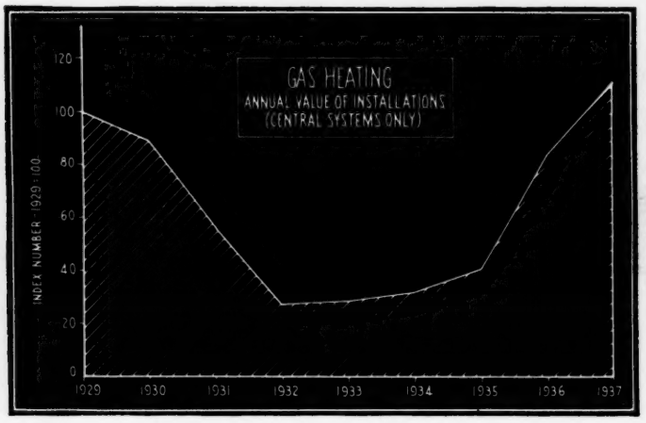
15 An estimate of the total value of the automatic heating business. Included is the installed cost of oil burners, heating stokers, and central gas-fired equipment. The values are as installed, not including heating system cost.



16 An estimate of the total value of the stoker business, including residential stokers, small and large commercial stokers used for heating, but not including industrial stokers used for power generation. Heater costs not included.



17 An estimate of the installed value of oil burners, not including industrial type burners. Included are costs of conversion burners but costs of boilers and furnaces in which they are installed are not included, except in the case of boiler-burner or furnace-burner units.



18 An estimate of the installed value of central gas-fired heating business. Included are the costs of gas conversion burners (not including boilers and furnaces in which they are installed) together with the cost of and installation cost of gas designed boilers and furnaces.

1937 Witnessed Improvements in Equipment, Practice and Sales

In this section the subject matter is confined to a review of events of interest as they affect heating and humidifying. This is in line with current ideas which consider the winter functions as being heating, humidification, or both. In preparing the material it has been necessary to contract some phases which are doubtlessly of interest and importance due to space limitations.

Stokers Continue Prominent

Outstanding in the events of 1937 was the rapid rise of the automatic stoker as a fuel feeding device. This rise continued a tendency which began to develop in the two preceding years. It was no doubt made possible by the mechanical improvements of the stoker and the solution of many of the technical problems in preceding years as well as to the fact that marketing problems in connection with stokers have also received a great deal of study. No doubt also much of the phenomenal increase was due to the fact that 1937 was also a year when more new residences were constructed than for some time.

Accompanying this increase in sale of automatic stokers—and to some extent probably the cause of it—were the organized commercial movements sponsored by the coal producing interests. The anthracite groups through Anthracite Industries, Inc., presented a sales and market development program which attracted a good deal of attention. In the same way the producers of bituminous coal through National Coal Association and its subsidiary, Bituminous Coal Research, Inc., loaned their help and assistance to development of a somewhat similar program for bituminous coal. At the beginning of 1938 there is every indication that coal for building heating purposes now has behind it the impetus of well-organized and well-financed trade organizations—which condition was much more mildly true in previous years.

Warm Air Heating

As an accompanying phenomenon to the increased construction of new residences the use of warm air furnaces also drew much attention throughout the year. There is little doubt but that the long research work of the national trade association and also well-organized selling pressure brought results during 1937. While it probably can not be stated that direct-fired warm air furnaces have demonstrated that they will absorb the residence heating market, still it is true that during 1937 the use of warm air for residence heating did improve its competitive position.

Trade Practices and Selling Methods

The year was exceptionally quiet as regards changes in trade practices and selling methods. This is in contrast to the turmoil which has characterized many of the past few years. Without doubt it reflects both the fact that sales policies and methods are now much more firmly established than was the case during the depression years, and also that with a greater volume of business available many managements were pre-occupied with securing as much of this business as possible rather than with development of sales plans or methods.

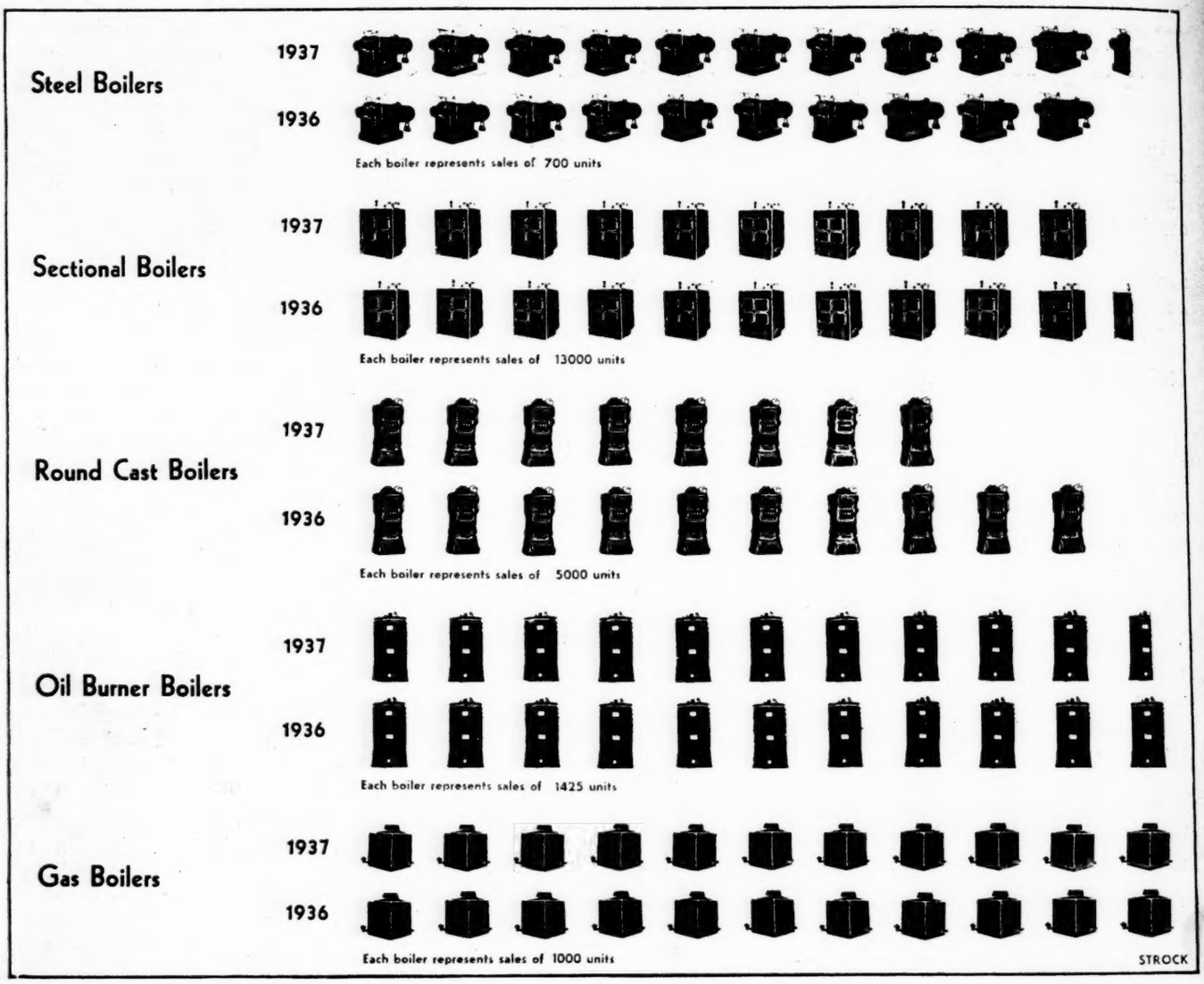
Technical and Engineering Aspects

Perhaps the most spectacular event of the year was the steadily increasing popularity of stokers. To a considerable extent the increased use showed that the pioneering and development stages in unit stokers are now past, and the selling phase is at hand. The underfeed screw mechanism continued to dominate the small stoker design. Bin-feed and automatic ash disposal are still live subjects, with most makers offering something but with these features usually optional. Quiet operation is stressed and improved appearance is constantly sought. Much design attention is concentrated on these phases. Control of air supply to coordinate air with coal-feed rate continues to call for close study. Most stokermakers now have adopted and incorporated some means of securing close control of air supply. One of the oldest stoker manufacturers announced an adjustable feed of distinctive design which may be attached to existing installations when desired and may be operated manually or automatically to produce air flow rates varying with the coal feed.

While new stokers and new models continued to appear throughout the year it should be noted that but few new manufacturers appeared. From this it seems reasonable to conclude that the period when new manufacturers are attracted is about over. Few, if any, manufacturers are now actually making both stokers and boilers or furnaces. In a few cases a single manufacturer is offering stoker-boiler or stoker-furnace units on the market but it will be found that these are usually made by someone else and simply put on the market under the name of the marketing organization. In a number of cases both the stoker and the boiler or furnace are purchased by the marketing manufacturer, merely assembled by him, and offered to his dealers or trade representatives as part of a line of equipment. This is especially true in the smaller sizes and with models offered to meet competitive conditions. Stoker-boiler combinations are more numerous now than stoker-furnace units.

The year produced but little evidence that the stoker is to be incorporated into a boiler or furnace, manufactured to one overall design, assembled at the factory, and offered on the market as a single unit. The stoker is still largely a conversion device put into existing boil-

COMPARISON OF BOILER SALES, 1937-1936



ers or furnaces which have to be adapted to the new operating conditions. Manufacturers of both boilers and furnaces moved to meet this situation during the year, for several brought out designs carrying features intended to make stoker installation easy. Many boiler and furnace manufacturers are now offering on the market special models for gas-burning, for oil-burning, for stokers, and for hand-firing with coal or coke. Stokers continue to be limited in their field of application in very small residences by the problem of designing a stoker of sufficiently small rate of coal-feed.

Oil and Gas Burners

Few new oil burners appeared on the market during the year. Principal changes in design of burners were in the direction of greater accessibility of parts with ready dismantling for repairs and maintenance. Dimensions were also affected generally by the desire to compact the burner as much as possible in order to help get it inside metal casings of boilers and furnaces. Increases in oil prices gave further incentive to the search for designs for handling the heavier and cheaper oils. The problem of designing progressively smaller capacity forced draft burners to reach the smaller residences continued to receive attention and at least one manufacturer has an automatic power burner of capacity for small installations.

Gas-burning equipment moved along traditional lines. To catch the small residence business several manufacturers brought out new gas designed warm air furnaces. One of the oldest manufacturers substantially redesigned his full line of products with numerous innovations. One power-driven conversion burner appeared.

Boilers, Furnaces, and Accessories

Boiler models appeared on the market during the year in large numbers. The great majority however carried no innovations in design, proportioning or materials, and were offered by their manufacturers for the accommodation of special fuels. Virtually all small boilers are showing the effects of the tendency to completely enclose all burners, instruments, controls and accessories inside one sheet metal casing. This treatment, while of no particular technical or performance importance, does permit ingenuity in artistic treatment. So general has the practice become that even larger boilers are being affected.

During the year a boiler for burning anthracite coal attracted much attention because of its sharply different design. The boiler was developed at the Anthracite Industries Laboratory, is compact, incorporates a gravity coal feeding method which demands a minimum of attention. As brought on the market by one manufacturer, it has a rotary grate discharging ash at the rim, an air intake at the sides, and a smokepipe or flue which passes through the coal storage hopper.

Applicational and rating methods with steam and hot water heat generating equipment underwent no marked technical changes in a year which was quiet from this standpoint.

Heating Surfaces

Several manufacturers of unit heaters brought out ceiling models of small size and of light weight to facilitate handling. As unit heaters continue to receive consideration for exposed locations, most of those announced during the year were carefully styled and finished to present an attractive appearance.

In recognition of the better acceptance accorded hot water heating systems in recent years several convector manufacturers brought out products for use with hot water in order to round out their lines. These generally present the same type of surface as steam-using convectors but are redesigned in detail to permit use with hot water systems. Cabinets and enclosures for accommodating convectors and tubular radiators underwent no notable changes. There was an almost complete absence of new tubular direct cast-iron radiator designs during the year. Several blast-type heating devices appeared and featured a means of securing uniform temperature distribution over their whole surface.

At a meeting in July the engineering committee of the Industrial Unit Heater Association proposed the elimination of unnecessary sizes of unit heaters and the publication of more precise performance data. Following this, the Association members adopted a series of five recommendations dealing in detail with the two proposals, and stated in full in HEATING & VENTILATING for October, 1937, page 69.

Steam Heating in 1937

The relative position of steam heating (or rather low pressure steam circulation for heating) at the close of 1937 as compared to its position in January, 1937, is difficult to determine at short range. Undoubtedly its popularity has been adversely affected by the rise of "air conditioning" as a catch phrase and as a means of securing both summer cooling and winter heating. Only the future can reveal the true importance to be attached to the current events.

As during the previous ten years to some extent, and especially during the past few years, 1937 saw control equipment continue to reach the market in forms designed to prevent overheating. The trend in such control equipment for steam heating is now reasonably clear. Orificing of either the fixed or adjustable variety appears to be on the way to becoming universal. Control continued to trend toward the central, whether this be control of oil burner, stoker, or motor-operated valve. And it is also perhaps significant that despite the wide popularity of the phrase "fully automatic" there has been an increase in the number of manual heating controls introduced during the year past.

One-pipe systems continued in large proportion because of low cost. Air valve development continued to feature the adjustable orifice as a means of providing a much-to-be-desired balancing of distribution in one-pipe systems fed by intermittent heat sources.

In heating specialty design there has been a marked trend toward the new alloys such as stainless steel and monel metal and away from commercial brass which was at one time almost universal. These more expensive alloys, originally introduced for service at higher pressures, are gradually being extended into apparatus for all pressures.

The occurrence of various and varied concealed convector arrangements has given rise to a still further growth in the variety of body arrangements required for radiator traps and valves. The variety required in this connection to meet specification demands is quite startling. Instead of a ½-in. radiator trap being required, for example, in one standard body, the average manufacturer must now manufacture, stock, and supply it in a total of some twenty different arrangements. Presumably this must cost money, and one of the economic approaches to lower heating costs (such as for housing) would be standardization and reduction of this and many other kindred items.

Outstanding among the steam heating installations completed during the year are undoubtedly the PWA Housing Projects, many of which have been covered editorially in previous issues of HEATING & VENTILATING. The *steam heating* distribution systems (some have hot water, some stoves) in these Housing jobs represent the most modern practice in the art. While incorporating all the latest practices they have been completed at what is probably the lowest cost ever applied to this type of installation, although, alas, according to the testimony of most manufacturers, contractors, and others concerned, the low cost is due more to the "profitless prosperity" sort of business which comes from the government's buying procedures, rather than as a result of any studied economic cost reduction such as is yearly illustrated in the automobile industry.

These housing installations are in all cases two-pipe vacuum steam heating systems with central boiler plants supplying steam to distribution mains at 30 lb. or thereabouts, thus permitting smaller mains, insulation, conduit and similar equipment, than would be the case if the steam were distributed at the low pressures desired for heating. Secondary reduction is provided at the entrance to buildings. While the presence of reducing valves might be considered an offsetting item, not only in the first cost but in maintenance, this is not much of a factor because in most cases steam is generated at 125 lb. per sq. in. and secondary reduction would be used as a matter of conservative engineering in any event. Making the primary reduction to 30 lb. at the boiler plant and the secondary reduction to 5 lb. or less at the buildings is proven by these installations to be sound economics.

With few exceptions the housing installations are orificed to balance distribution and are provided with central control through motor-operated valves and either outdoor or indoor thermostats, or combinations.

An interesting experiment in cost reduction was con-

templated by the specifications for two of these installations, but lack of courage, innate conservatism or good judgment resulted in a last minute change so that actual experience was not obtained. This experiment was to be the substitution of union elbows for radiator supply valves. Of course, such an omission could hardly be contemplated in an uncontrolled distribution system. The theory was that with orificing and effective central control the omission might be warranted, particularly in low cost housing, not that the initial investment was greatly reduced, but a considerable maintenance item would be eliminated. Breakage of supply valve handles, and similar items may run to a substantial figure in low cost housing.

Zoning is kept to a minimum in these projects for obvious low cost reasons. The general minimum is four zones with a result that in a number of installations a multiplicity of buildings controlled by several valves are placed under one zone control mechanism. The actual comfort conditions and steam consumption economy of these installations will afford a valuable index for engineers or future low cost housing work as to the extent to which zoning can be minimized to keep down both first cost and steam cost.

Heating of bathrooms and small kitchens in some of the projects is effected by heating risers. This gave rise to perhaps the first prominent instance where heated risers and central control were required in the same installation. With heating risers aggregating 35% or more of the total direct radiation load, control of heat output from the risers became essential. One proprietary method used was to carry a maximum vacuum on these risers; another, also proprietary, was to install an "inner-tube" inside the 2¼-in. heating riser. The "inner tube" is provided with orifice outlets at the various floor levels. Condensate and air are discharged in the space between the inner and outer tube. The result is "spot" heating of a portion of the riser at low pressure differentials, or maximum off intervals in mild weather.

Another outstanding example of steam heating in housing is pointed out by the Brighton Beach Garden Apartments installation described in HEATING & VENTILATING, February, 1937. Distribution piping in this job is a two-pipe vapor system with orifices in the intake and no traps or condensate pumps, condensate being returned by gravity through a wet return to the boiler. Control is effected by means of a clock mechanism outside thermostat and condensate temperatures.

Hot Water Heating

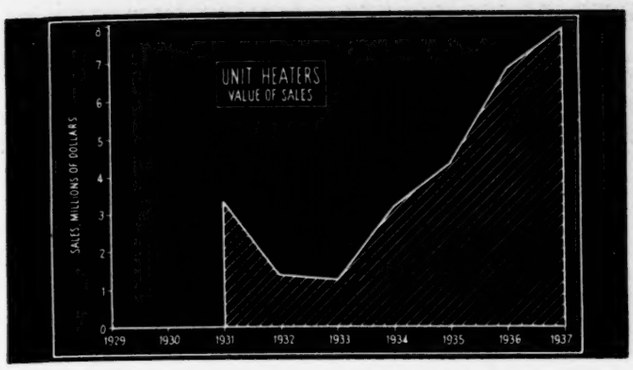
Forced hot water circulation in this form of heating has occupied the stage in late years to such an extent as to force simple gravity circulation into the background. During the year manufacturers of proprietary hot water heating systems laid especial emphasis on the matter of automatic control. By the end of the year virtually all makers of such systems had incorporated automatic control into their methods or had worked out means whereby it could be readily added.

Pipe sizing to secure suitable circulation with small pipes and still permit ready and simple rules to be quickly applied has long been a problem. During the year simplified methods of applying the usual data appeared. The problem of pipe sizing with hot water heating is still not fully solved.

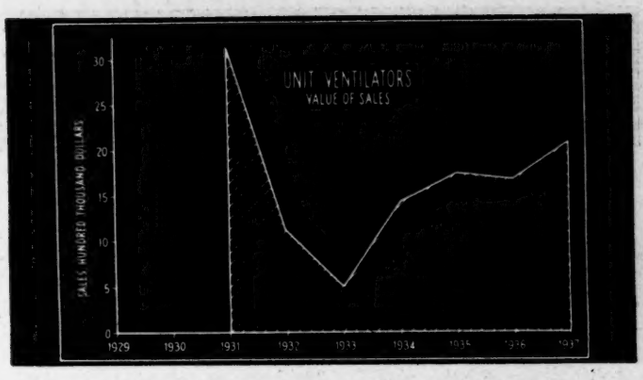
During the year one of the largest manufacturing and marketing organizations placed on the market a forced circulation, atmospheric, two-pipe hot water system, with built-in automatic controls adapted especially to residences. The heating units are of the convector type, made of copper, and copper tubing is used throughout. The heaters are for flush wall mounting, are compact (approximately 14 in. high, 10 in. wide, and 4¾ in. deep including motor), and are offered in one capacity (50 sq. ft.) only, lesser output than the 50 sq. ft. being obtained by reducing the fan speed through adjustment of a needle valve governing the supply of compressed air to the turbine. When more capacity than this is required additional heaters are installed. Each heater includes a fan driven by compressed air through a specially designed air turbine supplied from a central compressor. This arrangement permits ready fan speed regulation and consequently permits adjusting the heat output and air throw of the heaters within close limits. No inlet or outlet valves are necessary at the heaters. A room thermostat of the anticipating type starts and stops the heater fans and also controls the operation of the circulator centrally located near the boiler. This development contains features distinctly new and is stated to be comparable in first cost to that of a two-pipe, forced circulation, concealed radiator installation of traditional design.

Another manufacturer announced a system considered suitable for houses requiring up to 1000 sq. ft. of radiator surface. In this arrangement a circulator is used and forces water into a single main pipe, no return main being included. As the main passes a radiator a regular tee connection is made from the main to the radiator inlet while the radiator outlet is attached to the main through a special venturi fitting inserted into the main. The radiator return is connected at the low pressure region of the venturi and a differential in pressure is thus set up through the radiator which causes a part of the water from the main to be bypassed through the radiator and back into the main again. Application is simplified by keeping the size of the main constant throughout its length, and by using the same size radiator piping regardless of the radiator size. A check valve in the return prevents backward circulation.

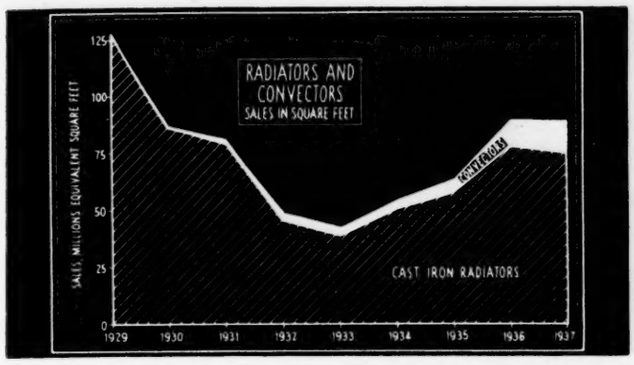
A central, forced distribution hot water heating installation was completed in one of the PWA projects at Atlantic City. Here use is made of the idea of mixing low temperature return water from the heating system with high temperature (230F) water from the boiler. The mixing valve is under thermostatic control from outdoors, thus causing the temperature of the water supplied to the system to vary with the load while maintaining a fixed rate of water circulation. With this plan the mixing valve is wide open in coldest weather and hot water at 230F is fed directly into the system, thus permitting use of heating surface in the buildings of the same size used for steam. An adjustable valve at each building permits keeping a constant differential pressure in the building regardless of changes in the pressure in the mains. Orifices are used at the entrance to radiators to secure suitable distribution to each radiator (see HEATING & VENTILATING, May, 1937, page 33).



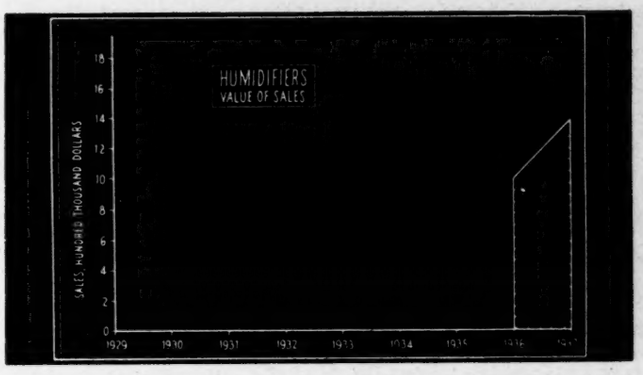
19 The sales of the so-called industrial type unit heaters which are also widely used for commercial purposes as well as in factories.



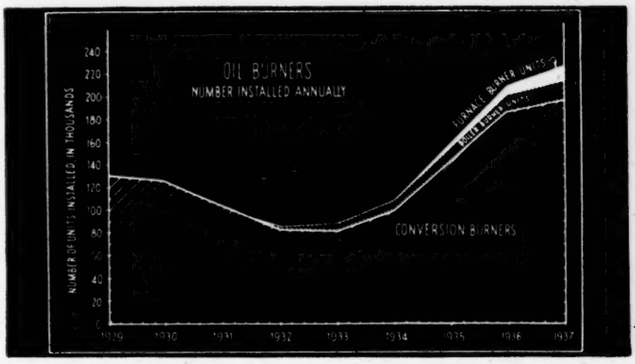
20 Sales of unit ventilators primarily used for heating and ventilating school buildings. The sales are in terms of new orders and do not represent installed cost.


RADIATORS AND CONVECTORS
SALES IN SQUARE FEET
SALES MILLIONS EQUIVALENT SQUARE FEET
CONVECTORS
CAST IRON RADIATORS
1929 1930 1931 1932 1933 1934 1935 1936 1937

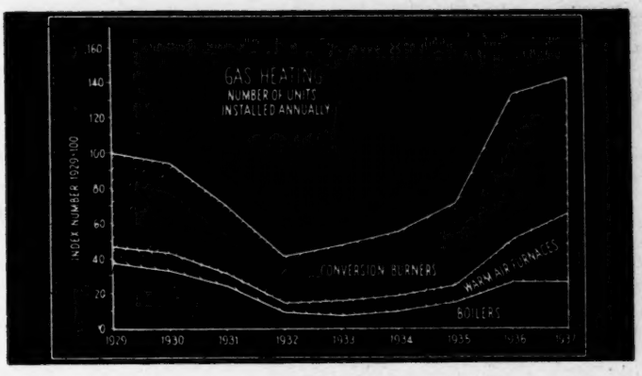
21 Sales in equivalent square feet of convectors and direct cast iron radiators. The convector figures include cast iron convectors as well as non-ferrous types.



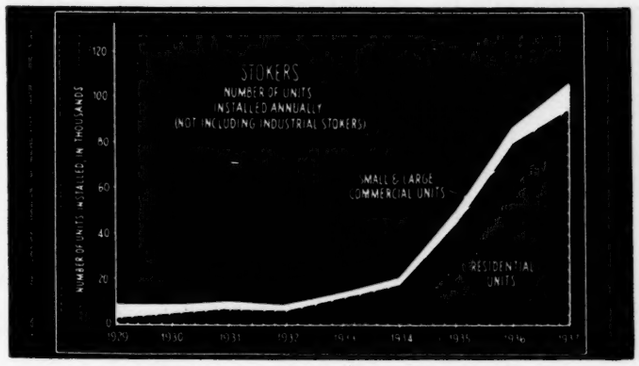
22 Sales of humidifiers as reported by a large number of manufacturers. Figures are in terms of new orders. Statistics for years prior to 1936 are not available.


OIL BURNERS
NUMBER INSTALLED ANNUALLY
NUMBER OF UNITS INSTALLED IN THOUSANDS
CONVERSION BURNERS
1929 1930 1931 1932 1933 1934 1935 1936 1937

23 The trend of oil burner installations during recent years. The conversion burner figures do not include industrial type burners. All figures are installations in the United States and do not include exports.



24 An estimate of the relative number of gas heating units installed by years, the figures being in terms of index numbers for which 1929 = 100. Space heaters are not included.



25 An estimate of the number of stokers installed annually. Industrial type stokers used for power generation are not included, but some small units for other than heating are included.

ANNUAL SALES

The trend of sales, plotted annually, of winter air conditioning devices. Data for Chart 22 are not available prior to 1936, while the figures for Chart 24 are estimates which are believed to be reasonably accurate. The data for Chart 21 are plotted in terms of equivalent square feet of direct cast iron radiators.

MONTHLY EQUIPMENT SALES

WINTER AIR CONDITIONING

1 Cast Iron Square Boilers
Shipments, Thousand Pounds

	1935	1936	1937
January	10,604	13,786	13,616
February	9,275	11,955	11,306
March	6,964	8,984	13,947
April	7,730	11,129	14,345
May	9,241	13,552	12,710
June	10,700	19,523	15,252
July	16,332	29,200	17,471
August	21,689	24,658	25,149
September	31,761	33,549	40,915
October	41,380	45,960	39,539
November	20,325	28,642	—
December	16,330	19,765	—
TOTAL	202,331	260,703	—

2 Cast Iron Round Boilers
Shipments, Thousand Pounds

	1935	1936	1937
January	2,666	3,120	2,244
February	2,494	2,437	1,897
March	2,102	1,664	2,131
April	2,115	1,683	1,808
May	2,493	2,243	1,622
June	2,710	3,193	2,130
July	3,647	3,905	2,325
August	4,368	3,634	3,386
September	6,879	5,809	5,807
October	9,485	8,633	5,898
November	4,957	5,202	—
December	4,018	3,562	—
TOTAL	47,934	45,085	—

3 Steel Heating Boilers
New Orders, No. of Units

	1935	1936	1937
January	190	444	400
February	163	453	411
March	191	347	781
April	296	373	412
May	803	416	420
June	323	639	520
July	355	758	818
August	535	783	1028
September	617	913	721
October	534	844	588
November	377	539	—
December	369	434	—
TOTAL	4,753	6,943	—

4 Steel Heating Boilers
New Orders, Sq. Ft. Heat. Surf.

	1935	1936	1937
January	63,385	214,719	173,564
February	55,611	209,172	191,623
March	75,171	156,130	364,409
April	106,485	162,279	174,397
May	356,648	182,593	179,388
June	146,547	312,718	195,324
July	146,931	343,698	334,875
August	221,525	313,895	415,213
September	216,720	302,925	235,770
October	191,442	285,138	187,776
November	107,140	187,695	—
December	183,076	157,883	—
TOTAL	1,870,681	2,828,845	—

5 Mechanical Draft Oil Burners
Shipments in U.S., No. of Units

	1935	1936	1937
January	3,089	5,511	6,600
February	3,145	5,515	6,870
March	4,130	6,883	11,021
April	6,589	7,788	11,467
May	7,507	9,850	10,833
June	7,783	11,387	10,876
July	7,608	14,138	12,456
August	12,493	17,347	17,747
September	23,175	29,770	28,142
October	21,209	28,236	19,817
November	7,465	12,756	—
December	5,613	8,232	—
TOTAL	109,806	157,413	—

6 Natural Draft Oil Burners
Shipments in U.S., No. of Units

	1935	1936	1937
January	72	96	74
February	69	39	45
March	34	32	56
April	39	24	74
May	60	32	53
June	20	52	18
July	44	54	29
August	82	95	45
September	212	143	108
October	268	189	150
November	133	160	—
December	82	77	—
TOTAL	1,115	993	—

7 Boiler-Oil Burner Units
Shipments in U.S., No. of Units

	1935	1936	1937
January	272	411	599
February	231	361	675
March	361	515	757
April	613	592	857
May	974	780	1,177
June	837	1,416	1,037
July	744	1,237	1,227
August	1,143	1,557	1,384
September	1,559	2,332	2,120
October	1,816	2,298	1,874
November	804	1,034	—
December	450	706	—
TOTAL	9,804	13,239	—

8 Furnace-Oil Burner Units
Shipments in U.S., No. of Units

	1935	1936	1937
January	45	221	463
February	40	230	523
March	53	223	755
April	96	344	660
May	135	286	782
June	137	545	874
July	197	560	936
August	333	776	1,316
September	594	1,050	1,430
October	706	1,130	1,315
November	399	846	—
December	277	619	—
TOTAL	3,012	6,830	—

9 Total Oil Burner Sales
Total of Tables 5-8, Incl.

	1935	1936	1937
January	3,478	6,239	7,730
February	3,485	6,145	8,117
March	4,578	7,653	12,589
April	7,337	8,748	13,058
May	8,676	10,948	12,845
June	8,777	13,400	12,805
July	8,593	15,989	14,648
August	14,051	19,775	20,492
September	25,540	33,295	31,800
October	23,999	31,853	23,176
November	8,801	14,796	—
December	6,422	9,634	—
TOTAL	123,737	178,475	—

10 Residential Stokers
Sales, No. of Units

	1935	1936	1937
January	1,241	2,114	2,516
February	1,113	2,442	2,694
March	956	2,473	4,923
April	1,046	3,006	5,359
May	1,706	3,589	6,096
June	2,432	4,342	7,813
July	2,872	5,488	6,452
August	4,931	8,433	11,590
September	8,687	15,061	16,608
October	8,777	16,584	14,492
November	4,287	7,857	—
December	3,078	4,897	—
TOTAL	41,126	76,286	—

11 Small Commercial Stokers
Sales, No. of Units

	1935	1936	1937
January	147	189	198
February	107	167	199
March	84	138	236
April	83	130	307
May	107	124	279
June	158	202	380
July	190	316	405
August	348	492	760
September	615	808	1,228
October	683	1,022	1,181
November	359	529	—
December	281	431	—
TOTAL	3,162	4,548	—

12 Large Commercial Stokers
Sales, No. of Units

	1935	1936	1937
January	61	84	185
February	48	71	228
March	37	41	167
April	33	44	202
May	41	60	205
June	55	78	289
July	96	148	392
August	164	198	657
September	272	270	933
October	268	303	920
November	145	301	—
December	108	185	—
TOTAL	1,328	1,783	—

At the Greenbelt project in Maryland opportunity was afforded for some experimental work on the heating systems. Here the unit of construction was small and the object was to provide accommodation for families of low income. Hot water heating systems were used, some of which involve innovations of much technical interest. Sufficient time has not yet elapsed to evaluate these methods. Briefly stated, the principal innovation consists of conceiving of the hot water heating system as being an adjunct of the domestic hot water supply, whereas the traditional methods have conceived of the domestic hot water supply as something to be attached to the building heating system (see HEATING & VENTILATING, June, 1937, page 51). This is a point of view which is novel and which in time may affect practice in small houses, especially if operating results from these installations are favorable.

District Heating

Utility district heating during the year was marked by a small revival of new construction. It was stated that the utility steam companies anticipated investing over $2,000,000 in plant and distribution system extensions. A slowly-developing promotion campaign to sell the idea of utility district heating took tentative form. The NDHA brought out the third edition of its "Principles of Economical Heating," summarizing its work in finding means of operating steamheating plants to best advantage (see HEATING & VENTILATING, May, 1937, page 72). No wholly new projects involving the entry of new companies into the business of supplying steam service were announced.

A point of technical interest during the year was the report of a German district plant where a centrifugal steam compressor direct driven by a steam turbine is used to maintain pressures in a distribution system during hours when bleeding of the turbine can not be practiced to advantage.

Much of the PWA program of multiple unit housing was constructed during the year although the principal design features were settled in previous years. Influenced by many considerations, these projects, when considered collectively, probably present a picture of the latest thoughts and methods on steam heating and steam distribution since this method was used in the great majority. Underground tile conduit was used generally throughout these projects where there was central heating; some form of automatic control was just about universal. At the close of the year these construction projects were largely completed. It is extremely likely that the methods used will serve as a guide for institutional projects just starting in a number of states, for the new slum clearance program under the Wagner Act, and for private developments of multiple apartments.

Statistical Position

Generally speaking, the statistical position of winter equipment improved in 1937 as compared with the previous year. Sales of the various types of equipment were up in most cases and those few which did register a decline showed only small losses as compared with 1936. The specific sales by months are shown in Tables 1 to 24 (pages 38 and 40) and a number of these items have been charted annually in Figs. 19 to 25, inclusive.

Convectors, both cast iron and non-ferrous, continued their slow encroachment upon the direct cast iron radiator, but the latter still dominates the market. Approximately 84% of the total square feet sales are in direct cast radiators, as compared with about 86.5% in 1936.

An interesting comparison would be one whereby all of the various heat-emitting devices used in a room could be plotted on the same chart. Unfortunately, this is difficult since sales figures of two of the principal equipment items are not in available terms of equivalent square feet of radiator, but in dollars. These two equipments—unit heaters and unit ventilators—both had a successful year in 1927. Unit heaters, formerly considered as having an entirely industrial application, now find an important portion of their market in commercial buildings. Sales of unit heaters in 1937 totaled close to $8 million. Unfortunately, figures are not available for the period prior to 1931, but as will be noted in the chart, sales for 1937 were ahead of any previous year for which figures are available.

Unit ventilator sales have not yet reached 1931 levels, but nevertheless are recovering gradually from the precipitous drop they experienced during the depression. Sales of humidifiers were expected to reach $1,400,000 during 1937, a sharp increase over 1936 when sales were $1 million.

The three charts dealing with the number of gas-burners, oil burners and stokers installed each year are of considerable interest. The chart relating to oil burners shows that the oil burner business still consists principally of conversion type burners, although you should keep in mind that an unknown but probably high percentage of these burners is installed in boilers especially designed for oil but not sold as an integral unit as are boiler-burner units. Furnace burner units during 1937 showed an increase, almost as many being sold as of boiler-burner units.

A striking gain is apparent in the sales of gas-designed warm-air furnaces, while gas-designed boiler sales in 1937 were approximately equal to those in 1936. The largest increase in gas equipment in units, as is shown on the chart, was in conversion burners, although the increase in percentage was greatest in the gas-designed warm air furnaces.

Residential stokers showed for the fifth consecutive year an important gain over the previous year. During 1937 it is estimated that over 90,000 residential stokers were sold as compared with about 80,000 in 1936.

Warm Air Heating in Residences

No especially outstanding technical developments took place during the year in warm air heating practices. The direct-fired, forced-fan furnace continued to receive much attention in the same fashion as has been true during the past several years. These furnaces continued to permit direct-fired warm air heating to push into larger and larger residences. No notable changes took place in the materials of construction of these furnaces nor did proportions of essential surfaces change. Most notable was the tendency for the sheet metal casing enclosing the furnace to be extended to also enclose burners, stokers, humidifiers, and controls. This tendency, not new during the year, has the effect

MONTHLY EQUIPMENT SALES

WINTER AIR CONDITIONING

13 Humidifiers
Orders, Dollars

	1935	1936	1937
January	—	$83,192	$164,399
February	—	79,401	160,734
March	—	43,401	170,689
April	—	57,016	160,274
May	—	65,395	166,136
June	—	82,323	163,162
July	—	101,552	69,623
August	—	73,921	96,060
September	—	83,506	100,689
October	—	125,087	65,005
November	—	87,045	—
December	—	107,240	—
TOTAL	—	$989,079	—

14 Unit Heaters
Orders, Dollars

	1935	1936	1937
Jan.	$284,005	$402,091	$494,053
Febr.	211,057	367,197	372,864
March	180,592	263,040	496,799
April	185,869	210,881	429,078
May	218,398	232,695	439,431
June	192,731	298,643	611,053
July	226,085	480,989	376,925
August	299,586	569,605	573,152
Sept.	510,983	773,205	895,580
Oct.	835,571	1,359,652	1,131,419
Nov.	577,003	990,487	—
Dec.	591,612	815,148	—
TOTAL	$4,310,492	$6,763,633	—

15 Unit Ventilators
Orders, Dollars

	1935	1936	1937
Jan.	$158,417	$202,503	$122,057
Febr.	67,521	216,401	119,719
March	109,051	130,570	197,210
April	138,362	190,302	77,465
May	118,440	196,048	78,492
June	187,129	168,572	89,388
July	112,356	123,926	212,752
August	132,012	133,389	170,969
Sept.	99,415	62,645	64,523
Oct.	69,357	96,381	87,953
Nov.	101,904	62,077	—
Dec.	441,336	92,299	—
TOTAL	$1,735,300	$1,675,113	—

16 Cast Iron Radiators
Shipments, 1000 Sq. Ft.

	1935	1936	1937
January	3,117	4,183	4,572
February	2,787	3,086	3,613
March	2,023	2,720	4,343
April	2,366	3,549	4,624
May	2,835	4,175	4,416
June	3,462	5,590	5,360
July	4,675	8,027	5,543
August	6,470	7,785	7,178
September	7,701	9,190	9,122
October	10,055	12,452	9,550
November	6,616	9,475	—
December	5,413	7,444	—
TOTAL	57,520	77,676	—

17 Non-Ferrous Convectors
Elements Only, Sq. Ft.

	1935	1936	1937
January	80,595	145,028	47,231
February	45,529	61,682	33,068
March	48,013	62,856	33,574
April	46,182	51,085	47,286
May	49,424	74,301	115,685
June	56,280	84,395	56,106
July	81,619	100,984	50,773
August	73,768	139,583	103,439
September	58,713	105,887	90,073
October	114,171	141,406	63,977
November	112,915	102,927	—
December	60,118	168,264	—
TOTAL	824,327	1,238,398	—

18 Non-Ferrous Convectors
Elements Only, Dollars

	1935	1936	1937
January	$8,321	$12,794	$8,883
February	5,735	8,270	6,133
March	5,707	9,089	6,368
April	8,238	9,516	7,387
May	7,549	17,440	19,160
June	10,854	13,713	9,831
July	13,315	16,757	9,386
August	11,581	24,219	19,443
September	8,087	19,408	15,178
October	13,146	25,770	10,591
November	13,021	18,089	—
December	9,075	28,043	—
TOTAL	$114,629	$203,108	—

19 Non-Ferrous Convectors
Sold Complete, Sq. Ft.

	1935	1936	1937
January	93,407	136,021	342,791
February	66,076	121,133	255,927
March	87,225	117,400	447,925
April	106,488	202,015	421,660
May	152,944	233,101	335,660
June	147,614	348,855	445,818
July	166,807	440,717	351,662
August	243,406	414,785	410,378
Sept.	186,531	447,562	483,642
Oct.	230,921	459,167	483,546
Nov.	170,231	425,617	—
Dec.	130,212	328,497	—
TOTAL	1,781,862	3,674,870	—

20 Non-Ferrous Convectors
Sold Complete, Dollars

	1935	1936	1937
January	$29,029	$52,848	$97,522
February	23,827	41,189	74,675
March	30,876	39,998	137,769
April	39,378	67,569	147,964
May	54,926	78,870	120,596
June	48,510	115,807	144,466
July	53,748	148,408	116,830
August	77,399	136,911	134,664
Sept.	61,487	134,277	156,434
Oct.	77,569	141,883	154,047
Nov.	55,845	136,271	—
Dec.	47,444	97,277	—
TOTAL	$600,038	$1,190,308	—

21 Non-Ferrous Convectors
Sq. Ft. Total Tables 17 and 19

	1935	1936	1937
January	174,002	281,049	390,022
February	108,605	182,815	288,995
March	135,238	180,256	481,499
April	152,670	253,100	468,946
May	202,368	307,402	451,345
June	203,894	433,250	501,924
July	248,426	541,701	402,435
August	317,174	554,368	513,817
September	245,244	553,449	573,715
October	345,092	600,573	547,523
November	283,146	528,544	—
December	190,330	496,761	—
TOTAL	2,606,189	4,913,268	—

22 Cast Iron Convectors
Sales, Sq. Ft.

	1935	1936	1937
January	111,732	292,724	427,185
February	66,093	223,077	478,057
March	142,465	229,324	464,734
April	137,854	277,678	557,941
May	209,179	550,513	612,516
June	245,830	612,618	640,202
July	271,623	802,851	854,667
August	423,581	754,954	1,081,867
Sept.	441,948	749,825	981,951
October	481,329	789,218	648,536
Nov.	365,116	655,942	—
Dec.	389,940	632,972	—
TOTAL	3,286,690	6,571,696	—

23 Cast Iron Convectors
Sales, Dollars

	1935	1936	1937
January	$31,564	$80,338	$136,687
February	20,134	66,424	145,021
March	41,569	66,007	153,103
April	42,494	84,322	174,545
May	60,430	155,386	189,630
June	73,284	172,507	211,588
July	81,861	231,595	252,562
August	116,418	229,235	324,857
Sept.	118,040	219,557	285,863
October	134,816	244,444	201,146
Nov.	101,505	190,613	—
Dec.	106,534	184,386	—
TOTAL	$928,649	$1,924,814	—

24 Convectors, All Types
Sq. Ft., Total Tables 21-22

	1935	1936	1937
January	285,734	573,773	817,207
Feb.	174,698	405,892	767,052
March	277,703	409,580	946,233
April	290,524	530,778	1,026,887
May	411,547	857,915	1,063,861
June	449,724	1,045,868	1,142,126
July	520,049	1,344,552	1,257,102
August	740,755	1,309,322	1,595,684
Sep.	687,192	1,303,274	1,555,666
Oct.	826,421	1,389,791	1,196,069
Nov.	648,262	1,184,486	—
Dec.	580,270	1,129,733	—
TOTAL	5,892,879	11,484,964	—

of enclosing all parts of the central heating plant in one continuous jacket which can be given art treatment and on which color can be used to advantage.

No notable progress was observed during the year in what is probably the sharpest problem confronting the direct-fired furnace method of warm air heating, viz: how to obtain suitable and adequate supply of service hot water. Coils in the firebox and water-backed firebox sections continue to be the favored methods unless separately-fired devices are to be used.

Keen interest was shown by furnace makers and furnace designers in the problem of getting automatically-fired furnaces of small enough size to tap the really small residence market in a way to secure automatic heating. Furnaces fitted up with oil or gas burners or stokers and rated at from 50,000 to 70,000 B.t.u. per hr. are the goal of this endeavor.

Probably the most generally useful single piece of technical information in connection with warm air heating produced in 1937 was the Technical Code for Design and Installation of Mechanical Warm Air Heating Systems which was published early in the year under the auspices of the National Warm Air Heating and Air Conditioning Association. This code set up a detailed procedure for the design, included the necessary technical data, and generally systematized the design methods (see HEATING & VENTILATING, April, 1937, page 44). It is notable that this code goes further in the use of currently available design data than had been formerly considered practical. Duct friction is estimated from a specially constructed chart (which chart does not agree with other duct friction charts in general use). Generally the code method is more detailed than the methods previously used by installers. How widely it is being used at present is not known.

The research program on residential warm air heating at the University of Illinois continued throughout the year. Prof. S. Konzo reported on this work at the Chicago meeting of the warm air association late in 1936, giving the results found when the residence was cooled with water (see HEATING & VENTILATING, February, 1937, page 64). At the June meeting in Cleveland, Professors Kratz and Konzo gave additional results, especially those found when a two-speed control of fan operation was used.

The Kelvin Homes

Late in 1936 the announcement of Kelvin Homes drew much interest. It was an idea whereby a basic floor plan of a six-room, two-story house could be rearranged in detail to permit a good deal of leeway to meet individual tastes while still retaining a largely standardized arrangement and functioning of mechanical equipment, including a year-round air conditioning plant. It was hoped that this idea would produce most of the anticipated benefits of standardized prefabricated construction while avoiding most of its shortcomings. As the plan was launched, the electric equipment was to be furnished to the home purchaser in a package to consist of (1) an electric range; (2) an automatic steam boiler using either oil, gas, or coal; (3) a basement air conditioning unit; (4) a cooling and dehumidifying unit; (5) a suitable set of operating controls; and (6) an electric kitchen refrigerator. The plan also included a substantially standard arrangement of air ducts, grilles and dampers to distribute the air properly. Thus the owner's needs for electrically-driven equipment were all included and were offered with a minimum of field erection, field planning, and field engineering.

One year after the plan was announced we are informed that 335 of these Kelvin Homes had been built, or were under construction, in 114 cities and towns throughout the United States. Careful records of performance have been collected. It is reported that the yearly operating costs of 15 of these homes erected in Detroit, covering all expenditures for electricity and oil for summer and winter air conditioning, domestic hot water, electric cooking, electric lights, electric refrigeration—averaged $183.76. For the period May 15 to September 15, 1937, the average cost of operation was $45.92, including cooling and dehumidification, and all normal lights and appliances, electric cooking, electric refrigeration, water for all purposes, and oil for automatic hot water.

As these houses are well insulated, new, and probably as carefully operated as can be expected generally, these results indicate the costs of these services in Detroit with the best modern practices. It is probably correct to conclude that in these houses all the services listed are now not costing much, if any, more than was paid for winter fuel alone only a few years ago.

Heating with Oil in 1937

A Statement by C. E. SHIELDS for Oil Burner Institute

The principal technical progress which 1937 has made apparent in the oil burner industry, as a whole, is a decided refinement in manufacturing technique. This broad term is used here to include such factors as improved functional engineering design, better machine finishing to closer tolerances, laboratory testing of materials, individual inspection of units, and an advance in skill and workmanship generally.

Discussion of improvements in design for better appearance, or "eye appeal," is not within the scope of this comment on purely technical progress, except as it serves to emphasize the fact that a good portion of this visual betterment was made possible and practical by the advances in functional design.

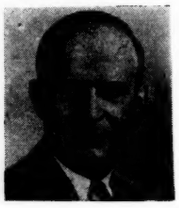
As might be expected, this progress has been made by the larger and more substantial individual organizations in the industry. It is evident in two ways. The first becomes readily apparent on examination of the current production of the leading organizations. The second item of evidence is the fact that the small and comparatively irresponsible manufacturers of oil burners have begun to pass out of the industry to a noticeable extent because they lack the experience, capital, and equipment to achieve and maintain the standards being set by the leaders, standards which are becoming more and more known to and demanded by the general public.

Anyone familiar with the oil burner industry knows that the progress here attributed to 1937 cannot be en-

tirely credited to that one year, but it is nevertheless true that the steady progress toward these refinements of manufacturing technique which has been slowly developing under the surface or behind the scenes, more or less, for the past several years became definitely effective in the production of 1937.

Paralleling this advance in the fabrication of the oil burner itself, the demands of this dominant group of oil burner manufacturers have compelled a consistent improvement and refinement of those necessary components in oil burner assembly which are not customarily manufactured by the oil burner manufacturer himself.

The result has been a definite increase in the potential efficient life of the oil burners produced by the leading companies. This naturally produces equally definite reduction in the amount of repair and service required for proper operation. The last few years have seen a rapid lessening of this need for "service," and acquaintance with the improvements achieved and incorporated in 1937 production makes it logical to predict that what once was a problem is no longer a matter of importance.



Heating with Anthracite in 1937

A Statement by
ALLEN J. JOHNSON
for Anthracite Industries, Inc.

The popularity and public acceptance of automatic heating with anthracite through the medium of stokers increased to a very marked degree during 1937. Corresponding technical, manufacturer, and merchandising interest in this type of burner and its controls combined to form what is perhaps the most significant advance during the year. The development of stoker models to remove coal directly from the storage bins constituted a technical achievement which overshadowed many other important improvements in such details as air supply, controls, construction, and styling.

An important factor was the final perfection of a semi-industrial stoker for anthracite which, as merchandised by a leading company, should prove to be a significant factor in supplying automatic heat from anthracite for apartment houses, office buildings, and structures of similar heating capacities. As an inadequately filled demand for this type of equipment has existed for a number of years, this combined underfeed and sidefeed burner will undoubtedly enjoy a widespread sale.

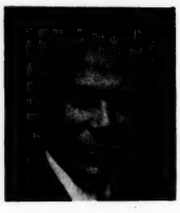
Winter air conditioning is rapidly recognizing the coal stoker as a result of which many manufacturers are now producing models exclusively for stoker firing. In addition, during 1937 one well-known manufacturer announced an air conditioner supplied from an anthracite-fired magazine feed heater. Many of the present installations of this model were used for summer cooling by means of circulating cold water through the heating coils.

Very material progress was made in service water heating with anthracite through the rather simple expedient of adding inexpensive service water regulators to the familiar bucket-a-day stoves. As a result thousands of such installations are being made to supplement the less satisfactorily regulated devices. A still further advance in this field is the addition of a small unit heater to the service water system to supply auxiliary heat for spring and fall, and supplementary heat for severe days. Experimental installations made by Anthracite Industries Laboratory have proven highly satisfactory and commercial announcement by a key manufacturer is expected prior to the next heating season.

Basket fireplaces for coal of a type in which air currents are circulated around the back to provide convected as well as radiant heating are becoming increasingly popular, as are space heaters designed with attractive cabinets and incorporating many improvements over the old base burner.

Coal-burning brooder stoves for raising small chickens have also enjoyed successful sales during the year. Larger stoves of a somewhat different type are also employing stokers.

In the field of research, undoubtedly the most outstanding advance of the year was the complete rebuilding, enlarging and extensive improvements to Anthracite Industries Laboratory. With 10,000 ft. of actively used floor space, not including an auditorium used as a training school, and other allied buildings, this laboratory is a model in the combustion engineering field, and its facilities coupled with the ever-increasing support of manufacturers promises additional developments of great interest to anthracite in the very near future.



Heating with Gas in 1937

A Statement by
C. GEORGE SEGELER
for American Gas Association

Opportunities for gas heating sales reached an all-time peak during 1937. New home construction absorbed many of the installations and, at the same time, there was no let-up in the sale to existing homes. Detailed statistics giving these increases are published separately in this magazine, but an important distinction with respect to the statistics is being introduced for the first time here. Previously published figures were merely the reports of a certain number of gas utilities who responded to annual questionnaires regarding central gas house-heating. Valuable though this information has always been, it has not presented a complete picture. The actual possibilities of gas heating sales are several times as great as those which the statistics had disclosed in the form in which they had been published. These facts are of importance because they reveal the existence of a very much larger market for the heating and ventilating industry.

In 1937, a preliminary effort was made to obtain complete information. Since the year has just ended, final figures are not yet at hand, but conservative estimates based on data submitted to date indicate that upward of two million homes are using gas heating. This figure is not directly comparable with previously published statistics because it has been drawn from more comprehensive sources.

At the end of 1937, it is estimated that central gas

heating installations total 735,000 and that an additional 1,300,000 homes are completely heated by gas, using one of the many methods other than boilers or central warm air furnaces; that is, space heaters, direct gas heaters, floor furnaces, unit heaters, and similar means. Using data comparable with that published in Statistical Bulletin No. 23 of the American Gas Association, issued January, 1937, which was confined solely to central heating installations, an increase of 22.1% is reported for the year just passed. Building heating for other than residential installations showed a similar increase.

New developments in appliances are of special interest in the low-priced home field. Through the use of gas, it is possible to reduce the cost of building small homes and, at the same time, provide low operating cost and increased comfort. The application of gas heating equipment in locations other than the conventional basement position makes it possible to save cost of excavating the basement. In many locations, this would result in a substantial reduction in the cost of a small house. The heating plant can then be put in a compartment or closet on the ground floor. For this purpose, one of the new types of vertical gas house heaters can be applied. While installations of this type have been in use on the West Coast for several years, they are rapidly spreading throughout the entire country.

One unusual application has been made in an apartment house in Boston and is regarded with great interest by builders as well as members of the heating profession. Each apartment is completely integrated, having a utility room in which a modern automatic gas heating plant and modern automatic storage water heater are located. A gas refrigerator and automatic gas range complete the utility services for each apartment.

Another unit which can be applied so as to reduce construction costs in new homes is the attic furnace. This saves the cost of the excavated basement as well as the cost of a chimney. Attic location merely requires a simple form of vent. These new gas units have great appeal to the modern builder, and the heating and ventilating industry will discover new markets with the growth of the trend towards this type of heating.

Heating with Bituminous Coal in 1937

A Statement by
RALPH A. SHERMAN
for Bituminous Coal Research, Inc.

Because of the rapid advance in the application of automatic firing equipment, the year 1937 saw many manufacturers as much concerned with production problems as development problems. Despite this concern, all manufacturers brought out improved designs and certain important advances were made.

General advances in stokers of the residential class followed along the lines of previous years. They included: Improved appearance, more rugged and more efficient transmissions, more sensitive and positive air controls, and improved design of feed screws, tuyeres and retorts.

Among the more radical changes in design are the following: A second manufacturer adopted the principle of controlling the feed of the coal by the resistance of the fuel bed, accomplishing this by a solenoid-operated clutch between the motor and the feed transmission. An agitating device for the fuel bed designed to break up the coke-tree formations that result from strongly-caking coals was placed on the market. Tests have shown that the agitator maintained a fire with less "hold-fire" time, resulted in quicker pick-up of the fire, and enabled satisfactory operation with coals that were difficult to burn on the conventional stoker. Disadvantages were a greater discharge of fly ash and a tendency toward puffs of smoke when the agitator lifted a fuel bed of coal with strong smoking tendencies.

Bin-feed stokers continued to gain acceptance. The automatic ash removal stoker for all bituminous coals remained in the development stage with manufacturers, but the one stoker of this type available only for semi-bituminous coal was sold in wider markets during the year.

Discussion continued on the merits of various sizes of coal for small stokers and many special sizes continued to be marketed. The Midwest Stoker Association revised its Coal Selection Chart to place the top size of coal for the residential stoker at 1¼ in. As a result of the program of research at Battelle Memorial Institute, Bituminous Coal Research, Inc., published its Technical Report No. 1, Part 2 of which showed that, although there was some merit to close sizing to avoid segregation and non-uniform feeding, only with strongly-caking coals was the performance of the coal improved by the removal of the smaller sizes.

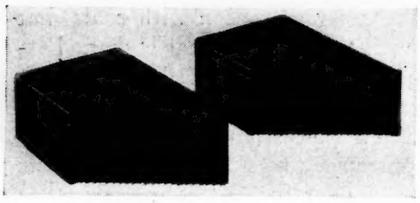
For the larger boilers used in industrial heating installations, pulverized coal and spreader stokers gained greater acceptance during 1937. The application of water cooling to the tuyeres of underfeed stokers continued to prove successful. Spreader stokers and pulverized coal are reputed to be less sensitive to coal characteristics than other types of burning equipment.

The Fuel Section of the Bureau of Mines made an important contribution to the published knowledge on coal for heating in its Bulletin 404, Burning of Coal and Coke Treated with Small Quantities of Chemicals, by Nicholls, Rice, Landry, and Reid. The results of an extended series of tests with 25 different chemical agents showed that the possible beneficial results of such treatment were practically negligible.

The Coal Research Laboratory of Carnegie Institute of Technology continued its research on coal and the previous work is now bearing fruit in results of practical value. The Laboratory has the cooperation of Bituminous Coal Research, Inc., in an investigation of combustion in fuel beds of large underfeed stokers.

Bituminous Coal Research, Inc., increased its rate of effort in research on coal utilization at Battelle Memorial Institute. In addition to the extensive program on the characteristics of coal for small stokers, a thorough study of the treatment of coal with oil to allay dust is being made, and attention is being given to the problems of the application of coal to larger stokers. A preliminary survey in this field revealed the need not only for more research but for a campaign to make available to those who buy and burn the coal the knowledge that we already have.

1937 Winter PROGRESS Equipment



Modine Hot Water Convector

NAME—Modine hot water copper convector.

PURPOSE—Convector designed especially for hot water.

FEATURES—Oval, seamless copper tubes instead of round tubes are used in these convectors. Four times as much tube surface is used in the hot water units as in the Modine steam units, resulting in a ratio of prime surface (tubes) to secondary surface (fins) of one to four. The manufacturer states that the use of this convector makes possible a performance that in comparison with steam is subject to no penalty of capacity other than that arising from the direct ratio of the temperature of the two heating media. It is said that by installing hot water type Modine convectors in a hot water system no additional heating capacity over and above that regularly required for ordinary direct radiation need be added.

MADE BY—*Modine Manufacturing Co., Racine, Wis.*

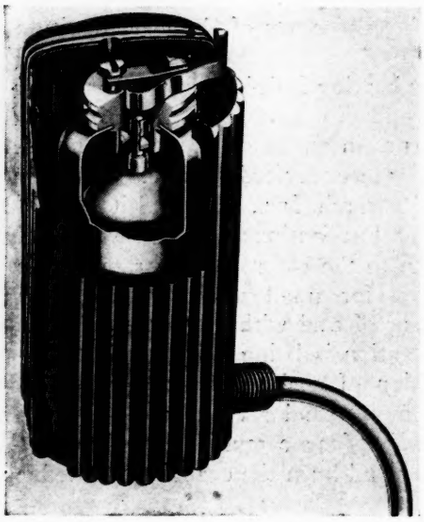
Detroit Radiator Venting System

NAME AND MODEL NUMBER—Ideal fast-venting system consisting of Arco-Detroit No. 300 Multiport for radiators and a No. 861 Hurivent for mains.

PURPOSE—For quick venting on one pipe steam systems.

FEATURES—These venting valves incorporate an automatic modulator which is said to eliminate all the obstacles to large port venting without sacrificing any of its advantages. Valves are said to vent at maximum port opening until the pressure rises to approximately 2 oz. and then automatically revert to a port opening proper for the normal pressure. The No. 861 Hurivent is said to vent approximately 22 times as fast as the average vent valve and the No. 300 Multiport is said to vent approximately three times as fast as the average air valve. The Multiport for radiators carries a manual adjustment which reduces its maximum port opening by any amount needed to compensate for the size and location of the radiators. The adjustment of the Multiport is said to be proportional to the movement of the adjusting arm. A muffling chamber on the Multiport is designed to stop objectionable noises. It is also said that should loose scale prevent valve closure under water, the molded jacket will prevent splitting. The Multiport has a jet black jacket trimmed with chromium.

MADE BY—*Detroit Lubricator Co., Detroit.*



Burdett Gas Conversion Burner

NAME—Burdett radiant heat conversion burner.

PURPOSE—For converting boilers or furnaces to gas heating.

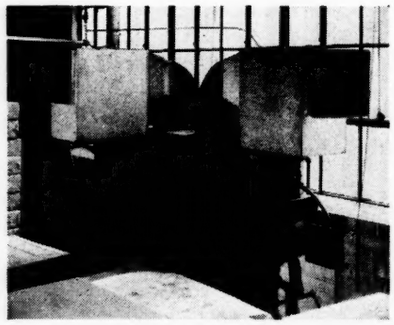
FEATURES—Gas is mixed with air and is taken by a pipe to the center of the burner head. The mixture is then deflected downward by a baffle, ignites and strikes the center of the disc. The heat scours down and outward to the edge of the refractory disc and the manufacturer claims that in less than 45 seconds a temperature approximating 2300F is obtained. A number of these burner heads are used and the conversion of each individual heating unit is accomplished by use of a custom-built manifold which permits the radiant heat from the burner heads to duplicate as nearly as possible a bed of glowing coals. The manifold is installed in relatively the same position as the grates which have been removed. All of the air for combustion is furnished by a blower which permits the installation of baffling to increase the heat absorption and lower the stack temperatures.

MADE BY—*Burdett Manufacturing Co., 19 N. Sheldon St., Chicago.*

Humidity Box

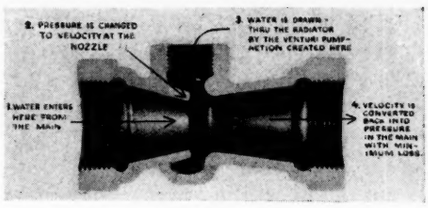
NAME—Humidity box.

PURPOSE—For introducing moisture in spaces warmed by unit heaters.



FEATURES—This device is essentially a spray or fog chamber and is provided with a water filter and nozzle, air filter and eliminator or baffle, and drain fitting. When water pressures of 30 lb. per sq. in. or over are available, this device works directly from the water line. Under these pressures an electric vaporizer is used to secure atomization. Illustration shows two humidity boxes on the warm air outlets of a blower type unit heater. It can also be used with a propeller fan type unit heater or with warm air ducts.

MADE BY—*The Air Conditioning Supply Co., 1893 E. 55th St., Cleveland, Ohio.*


2. PRESSURE IS CHANGED TO VELOCITY AT THE NOZZLE
3. WATER IS DRAWN THRU THE RADIATOR BY THE VENTURI PUMP-ACTION CREATED HERE
1. WATER ENTERS HERE FROM THE MAIN
4. VELOCITY IS CONVERTED BACK INTO PRESSURE IN THE MAIN WITH MINIMUM LOSS

Taco One-Pipe Hot Water System

NAME—The "Taco-One" venturi hot water heating system.

PURPOSE—A single pipe hot water heating system for buildings requiring up to 1000 sq. ft. of radiator surface.

FEATURES—Heating system utilizes only one main. The supply side of the radiator is connected to the main with an ordinary tee while the return side is connected with a Taco venturi fitting. This fitting is designed to cause a suction on the return from the radiator so as to draw hot water through the radiator. One size of pipe is used throughout the entire main. Venturi fittings are tapped with ½-in. connections and one size pipe may be used to all size radiators. One size circulator is used on most jobs up to 1000 sq. ft. of radiator surface. A single flow check on the boiler outlet is provided to prevent hot water from backing out of the boiler into the radiators during periods when heat is not needed. Special bronze Taco venturi fittings are available for systems using copper instead of steel pipe.

SIZES—For buildings requiring up to 1000 sq. ft. of radiator surface.

MADE BY—*Taco Heaters, Inc., 342 Madison Ave., New York.*

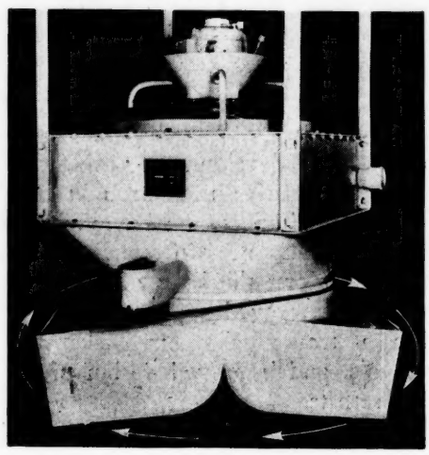
Wing Unit Heater

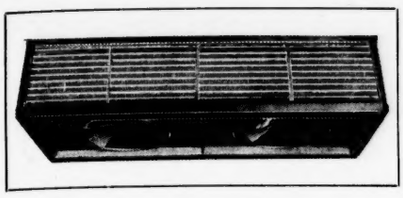
NAME—Revolving discharge unit heater.

PURPOSE—For supplying heat in all directions.

FEATURES—Unit heater utilizes moving air stream which sweeps slowly around through 360° covering successively every direction. It is said that the constantly changing direction of flow causes the air to find its way around obstructions and keeps every point at a comfortable temperature. The revolving discharge portion of the new heater may be had separately for attachment on other Wing heaters already installed.

MADE BY—*L. J. Wing Mfg. Co., 154 W. 14 St., New York.*





Trane Multiple Projection Heater

NAME—Trane multiple projection heater.

PURPOSE—A unit heater for projecting warm air down to the floor.

FEATURES—This multiple projection heater employs the same operating principles as the new Trane projection unit heater. It is primarily designed and intended for use where a maximum of space must be heated with a minimum of units. The manufacturer claims that a single unit mounted in the center of a large space will take care of the huge floor area. The heater consists of two Trane extended surface coils contained within a metal casing. The motors are mounted out of the path of the air on a resilient construction. A new blade propeller fan, designed for quiet operation, is employed. In operation this heater draws warm air from the ceiling, through the two heating coils and then projects it straight downward in a vertical stream to the floor.

TYPES AVAILABLE—Available with two, three or more fans.

MADE BY—*The Trane Co., La Crosse, Wis.*

National Radiator Boiler

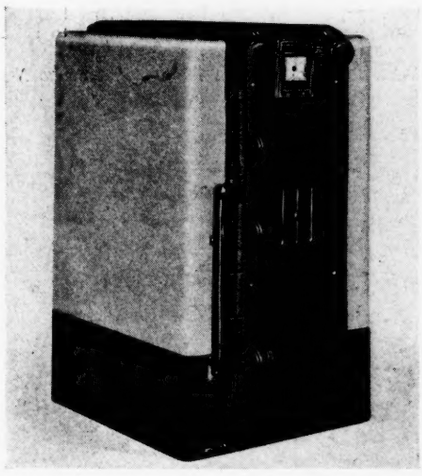
NAME—National Radiator residential heating boiler.

PURPOSE—For residential heating using hand, stoker or oil fired.

FEATURES—Boiler is finished in a baked red and black enamel and has rounded corners of the side panels and a double roll at each edge of the center front panels. A foot pedal is provided to open the ashpit door. Control knobs located at the front of the boiler serve as a means of adjusting the damper regulator and smokehood damper. The steam boilers of the hand-fired type have a built-in domestic heating coil recessed in the back section. On the stoker- and oil-fired types provisions are made for two sizes of storage type hot water heaters. The grate shaking mechanism is made up of six parts, all of which can be removed by withdrawing one cotter-key. A grate lock is provided to lock all of the grate bars in a level position. A special outlet tapping is provided on the front section for water boilers operating with a circulator. The location of this tapping is said to prevent short circuit of the water from the return to the nearest outlet without passing the full length of the boiler when under pressure set up by the circulator.

SIZES—Rating for hand-fired type ranges from 225 to 750 sq. ft. steam and 360 to 1200 sq. ft. hot water.

MADE BY—*National Radiator Corp., Johnstown, Pa.*

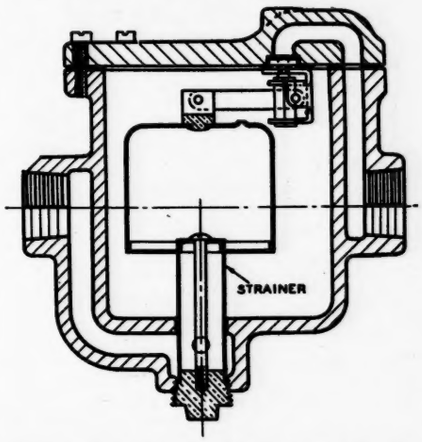


Sarco Bucket Trap

NAME AND MODEL NUMBER—Straightway inverted bucket steam traps, models BMO and BHO.

PURPOSE—To allow the passage of steam condensate.

FEATURES—Inlet and outlet connections are arranged on opposite sides of the body on the same center line to provide a straight-through connection. This arrangement has the advantage of simplifying the pipe connections in a number of installations, particularly in connection with small equipment. As in all other Sarco inverted types this trap has all the working mechanism attached to the trap cover so that it can be removed by lifting off the cover without disturbing the pipe connections. A strainer is built in the trap.



SIZES—One size with either ⅜ or ½ in. inlet and outlet connections.

MADE BY—*Sarco Co., Inc., 183 Madison Ave., New York.*

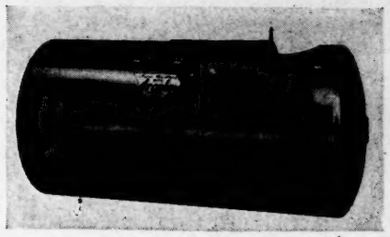
Anchor Furnace Stoker Unit

NAME—Anchor Kolstoker heating system.

PURPOSE—For supplying warm air using stoker-fed coal.

FEATURES—Both the stoker and furnace are said to be designed to function together with maximum efficiency. It is said that the heating system will deliver full heating efficiency at all times because of a self-cleaning radiator. Extra heavy cast iron construction and asbestos linings are used. The firebowl sections are almost 1 in. thick and heavily webbed. Deep grooved joints and wide bearing surfaces are provided between the sections to prevent leaks. The design offers eight radiator connections and four smokepipe positions. Furnace has a removable plate for the installation of a fan and filter unit. A special coil is available for hot water in warm weather. Shifting the position of a reversible lower section permits the stoker installation from either side or front. The stoker is equipped with a sectional burner head and a complete automatic control of coal feed and temperature. It is enclosed in a soundproof cabinet finished in black and red.

MADE BY—*Anchor Stove & Range Co., New Albany, Ind.*



American Radiator Expansion Tank

NAME—Self-filling Arcoloy expansion tank.

PURPOSE—Rust-resisting expansion tank for any type of hot water heating system.

FEATURES—A float valve, easily accessible through sliding cover in tank, offers provision for automatic supply of water at all times. The opening in the top of the tank also serves as a safety feature for either gravity or forced systems by preventing the development of pressure as the water is heated, and in addition permits a forced warm water system to operate as an open system. According to the manufacturer, Arcoloy has a higher resistance to ordinary corrosive agents than pure copper.

SIZES AVAILABLE—10, 20, and 30 gal.

MADE BY—*American Radiator Co., 40 W. 40th St., New York.*

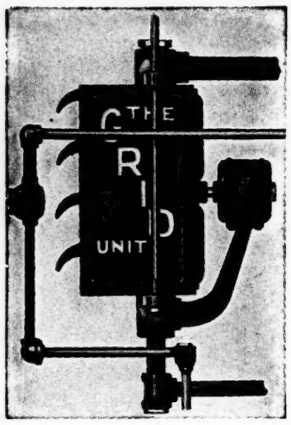
Electric Air Industrial Heater

NAME AND MODEL NUMBER—Electromode industrial heater, model IBN.

PURPOSE—For heating by electricity.

FEATURES—The heating source is a cast aluminum grid which has been poured around a calrod heating element. This grid construction is said to eliminate all hot wires and dead air spaces. A motor-driven, four-bladed aluminum fan, running on a graphite impregnated bronze bushing dissipates heat from the entire surface of the grid and circulates the warm air. It is said that heat can be directed wherever it is needed by moving a series of adjustable deflectors mounted on the front of the unit. Heater is equipped with an on and off switch and is provided with a thermal safety switch to prevent damage to the grid from overheating should the fan or air circulator stop. It is also obtainable with a thermostatic control. Heater may be suspended from the ceiling by means of eyebolts or fastened to the wall with angle braces.

MADE BY—*Electric Air Heater Co., Div. of The American Foundry Equipment Co.,* 555 *S. Byrkit St., Mishawaka, Ind.*



Unit Heater Humidifier

NAME—Grid humidifier.

PURPOSE—A humidifier to be attached either in front of a unit heater or directly behind.

FEATURES—It is said that to install this humidifier no air lines or extra piping are needed. The operation of the humidifier is at temperatures higher than the room atmosphere, which is said to cause quick absorption of the humidifying fluid. The humidifier may be operated with the unit heater or as an individual unit and even though the fan on the unit heater is shut down, the action of the device continues until the desired conditions are reached.

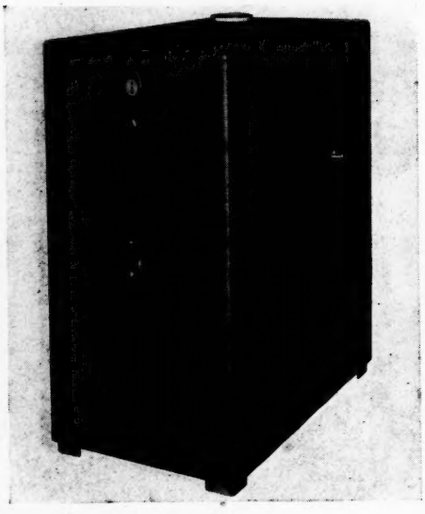
MADE BY—*The Unit Heater & Cooler Co., Wausau, Wis.*

Bryant Gas Boiler

NAME AND MODEL NUMBER — Bryant boiler, No. 25.

PURPOSE—For steam and vapor heating utilizing gas as a fuel.

FEATURES—Special heating sections which are said to produce a high heat exchange efficiency are used. All of the controls are completely enclosed by a cabinet which also encloses all valves and piping. All exposed bolt and screw heads are eliminated by lock-seam joints. It is said that the entire cabinet can be assembled or removed in a few minutes. Controls consist of a combination steam pressure governor and low water cutoff, combination thermostatic pilot and air burner, throttling control valve, safety valve, pressure regulator, and a pressure and vacuum gage.



SIZES AND CAPACITIES—Six sizes ranging from 145 to 385 sq. ft. of direct cast iron radiator surface.

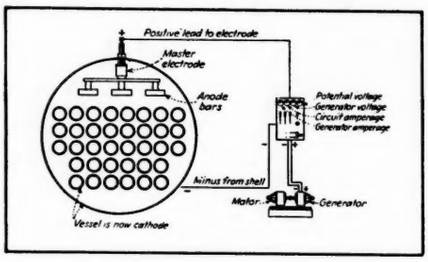
MADE BY—*The Bryant Heater Co., Cleveland, Ohio.*

Kirkaldy Boiler Protection System

NAME—Kirkaldy system of metal protection.

PURPOSE—An electrolytic system for preventing corrosion and boiler scale.

FEATURES—The Kirkaldy system is said to take into consideration the causes for corrosion rather than its effects. It is claimed that it controls corrosion by confining it to bars and metal placed into the boiler water for that purpose. The installation consists of a number of suitable anodic bars or disks



made of mild steel or carbon mounted within and electrically insulated from the boiler or condenser, an electric motor generator and automatic current controller, a control switchboard and the necessary wiring to complete the circuit.

METHOD OF OPERATION—With the system in operation the boilers, condensers, pumps, heaters, and pipe lines have a negative polarity instead of the usual positive polarity. The positive poles of the system are the anodic bars. This reverse polarity is said to prevent corrosion of the equipment. It is maintained by a weak direct current supplied by the motor generator and controlled at the small switchboard. It is also said that scale and slime cannot adhere to the walls of the equipment since the acid radicals, such as carbonate, sulphate and silica, which are necessary in building up the scale are electrically carried away to the anodes and away from the equipment surfaces. If the scale is already present when the installation is made, it is said that a thin film of liberated hydrogen which is formed on the metal walls of the equipment will gradually loosen the scale and remove it altogether. The voltage required is from 5 to 10 volts depending on the conditions and the current consumption is said to be approximately 0.4 kw-hr. per day per 1000 sq. ft. of protected surface with salt water and 2.0 kw-hr. per day per 1000 sq. ft. with fresh water.

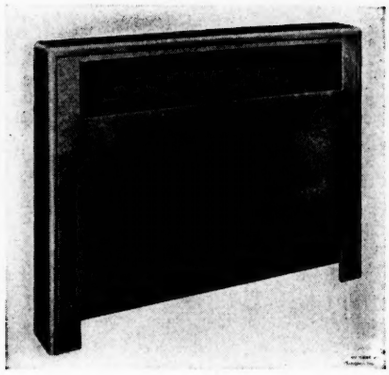
MADE BY — *Electrolytic Metal Protection, Inc., 247 Park Ave., New York.*

American Radiator Convector Enclosures

NAME—American Radiator convector enclosures.

PURPOSE—Enclosures for convector type radiator.

FEATURES—Enclosures are made with horizontal discharge grilles which are integral with the front panel of the enclosure. Enclosures are available for all sizes of both Arco convectors and New Murray radiators. The inlet arch is the same as the company's present free standing enclosures and the discharge grille can be either 3¾ in. or 4¾ in. high with the horizontal bars spaced on ½ in. centers. The removable front panel of the enclosure is made with a lock strip channel



that provides additional stiffness and holds the plate in place the entire length of the enclosure. Optional features include pull chain dampers, top outlet grilles, custom-built units in other than standard length and height, and panel molding to permit a series of enclosures to be installed together.

MADE BY—*American Radiator Co., 40 W. 40th St., New York.*

Minneapolis-Honeywell Lo-Water Cut-off

NAME—Minneapolis-Honeywell Lo-water cut-off.

PURPOSE—For protecting steam boilers.

FEATURES—The Lo-water cut-off can be installed according to the ASME boiler code or in the gage glass fittings. It is designed to fit standard half-inch gage glass openings. Copper tube between mountings can be cut to accommodate various center dimensions and shaped to allow for slight misalignments. Switch mechanism may be removed without dismounting the instrument from the boiler. Apparatus is designed for use with pressures not exceeding 10 pounds per sq. in. A manual reset is obtainable at slight additional cost to necessitate manual attention to restore burner operation.

MADE BY—*Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.*

Trent Vane Type Electric Heater

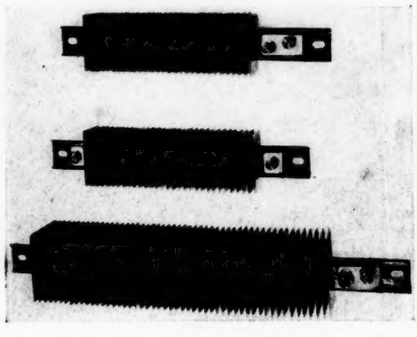
NAME—Trent vane type electric heater.

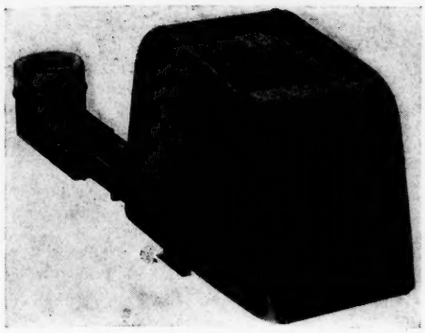
PURPOSE—For heating air with electricity.

FEATURES—The unit is made up of an electrical heating strip with the addition of metal vanes which are welded to the flat tubular sheath of the unit. It was said that this construction results in a high rate of conduction of heat from the unit to the vanes and consequently rapid convection of heat. Heating unit casings are available in either steel, alloy of steel, or copper. Various terminal arrangements are available.

SIZES AVAILABLE—Eight standard lengths with variation of wattage and voltage to suit user's requirements.

MADE BY—*Harold E. Trent Co., 618-640 N. 54th St., Philadelphia, Pa.*





Butler Stokers

NAME—Butler standard and de luxe model domestic stokers.

PURPOSE—For automatically burning coal in domestic stoker boiler system.

FEATURES—These new stokers are much the same as the previous models manufactured by this company except that the hoppers are of a new design and are supplied in a hammerloid finish. This new finish gives the stokers a "hammered steel" effect and they now come in blue, white, green, bronze, red, and black. The de luxe model hopper, which is illustrated above, is trimmed with chromium.

MADE BY—*Butler Manufacturing Co., 13th and Eastern Ave., Kansas City, Mo.*

Fulton Register Shield and Humidifier

NAME — Fulton register shield and humidifier.

PURPOSE—For supplying moisture and trapping dust.

FEATURES—Unit is designed to be attached to any register with a screwdriver. The manufacturer states that the humidifier will trap dust rising with the heat and will also supply moist air to the room. Two models are available, one for use on wall registers and one for floor registers.

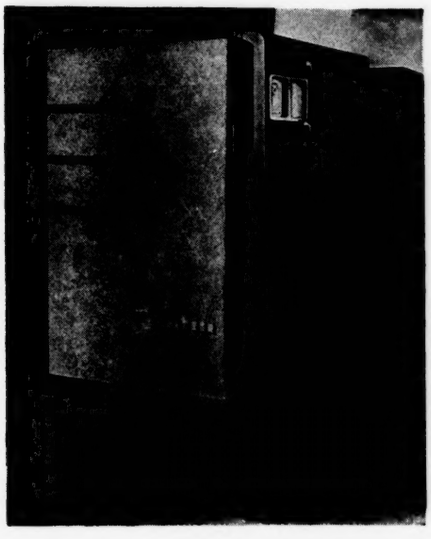
MADE BY—*Patent Novelty Co., Fulton, Ill.*

Spencer Boiler Jacket

NAME—Spencer Heater new oil burning boiler jacket.

PURPOSE—A modernistic jacket for the Spencer line of oil burning boilers.

FEATURES—The jacket is produced in a metallic luster lacquer in two tones of silvery blue-gray. The color is said to be sufficiently neutral to blend with the oil burner or stoker equipment and with practically any color scheme that may be used in finishing the basement room in which it may be placed.



MADE BY—*Spencer Heater Co., Williamsport, Pa.*

Bryant Duct Heater

NAME AND MODEL NUMBER — Bryant model D-85-C duct heater.

PURPOSE—A gas-fired heater operating on the same principle as a steam coil.

FEATURES — Manufacturer states that this heater can serve as an auxiliary heater in a central fan type distribution system. It is applicable to office buildings, theaters, stores, and auditoriums where heat requirements can not be met with present equipment. Required minimum air flow through the equipment is 1000 c.f.m. Standard equipment includes chromium steel alloy heat exchanger tubes, cast-iron combustion chamber and flue collector, combination shap valve and pressure regulator, thermo pilot, fixed burner orifices, built-in draft diverter, 1-in. pipe hanger support brackets, and a blue crackle finish jacket.

SIZES AND CAPACITIES—Designed to fit a standard 17¾ by 17¾ in. duct, input rating 85,000 B.t.u. per hr.

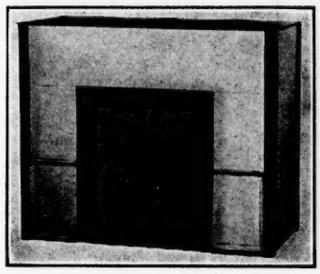
LITERATURE AVAILABLE—Bulletin 310.

MADE BY—*The Bryant Heater Co., 17825 St. Clair Ave., Cleveland, Ohio.*

Emerson Furnace Blower

NAME AND MODEL NUMBERS—Emerson Electric package unit furnace blower, No. 14, 17-E, 30-E, and 50.

PURPOSES—Furnace blowers.



No. 17-E Emerson furnace blower

FEATURES — Special design blower wheels are mounted directly on the motor shaft and the motor is rubber mounted to provide quiet operation. Nos. 17-E and 30-E are shipped complete with filters and both have eight-speed control units and canvas connectors No. 14 blower is shipped with two filters and two-speed snap switch. No. 50 unit is shipped with an eight-speed control unit and canvas connector. A separate filter unit with five filters can be supplied with this latter blower.

CAPACITIES—Maximum free air deliveries, No. 14, 1100 c.f.m.; 17-E, 1420 c.f.m.; 30-E, 2600 c.f.m.; and 50, 4950 c.f.m.

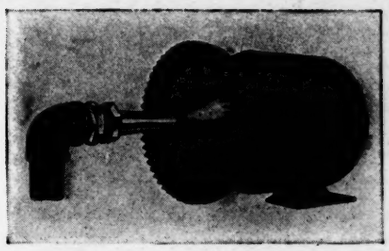
MADE BY—*The Emerson Electric Mfg. Co., St. Louis, Mo.*

Murray-Preston Spray Wheel

NAME—Murray-Preston spray wheel.

PURPOSE—For generating water spray.

FEATURES—This spray wheel is made of metal or alloy to meet the respective chemical or corrosion conditions and is totally machined. The spray or fog-generating medium is an integral part of the entire unit. Delivery is through the nozzle and it is said that the spray wheel cannot become clogged no matter what the form of contamination. The manufacturer claims that the device is self-cleaning and forms a steady uniform spray. It is readily adaptable to air washers or other equipment having banks of spray nozzles. The manufacturer states that low pressure requirements, together with its large space coverage, make for lower operating cost. The motor is directly connected and is of the totally enclosed and splashproof type.



MADE BY—*D. J. Murray Mfg. Co., Wausau, Wis.*

G-E Oil Boiler

NAME AND MODEL NUMBER—G-E oil boiler, type LA-3.

PURPOSE—For supplying steam or hot water using oil as a fuel.

FEATURES—Boiler is of welded steel construction and it is equipped with an indirect heating coil for domestic hot water, safety relief door, safety valve, pressure gage, low water cutoff, water level indicator for steam boilers, and an altitude gage and thermometer for hot water boilers. The boiler is of the vertical type with concentric flue surfaces and firebox of steel. One inch of asbestos insulation is used. During the starting cycle a flame detector permits continued oil flow only if combustion is properly established. In the event of flame failure after combustion is established, the motor compressor is immediately stopped and the oil valve closed.

SIZES AND CAPACITIES—Maximum rating, 100,000 B.t.u. per hr., equivalent to 417 sq. ft. of steam radiator surface or 667 sq. ft. hot water surface.

MADE BY—*General Electric Co., Air Conditioning Dept., Bloomfield, N. J.*

Crane Autocoal Stoker

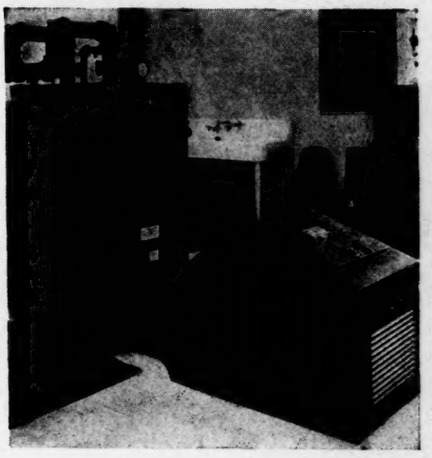
NAME—Crane Autocoal stoker.

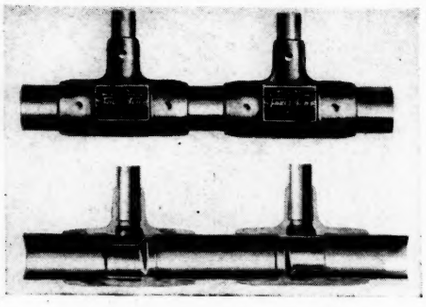
PURPOSE—For automatic firing of coal.

FEATURES—Each stoker is provided with a room thermostat, hold fire control, limit control, and a clinker tong. Main advantages claimed are economy of operation and maintenance.

SIZES AVAILABLE—Five sizes with hopper capacities of 350 and 500 lb. with varying coal feeds.

MADE BY—*Crane Co., Chicago, Ill.*





Stevens-Root Streamline Force-Flo Hot Water Tee

NAME—Force-Flo copper streamline shunt-tee.

PURPOSE—For installation on force-flow single main hot water heating systems.

FEATURES—Manufacturer claims that the new streamline shunt-tee will reduce cost of installation and operation on copper heating work and will improve appearance by reduction of pipe sizes and number of mains. Basic principles of design on this new tee are the same as on the other shunt-tees made by this company.

MADE BY—*The Stevens-Root Co., 51 E. Grand Ave., Chicago.*

Foster Wheeler Expansion Joint

NAME AND MODEL NUMBER—Stainless steel bellows expansion joint, type S.

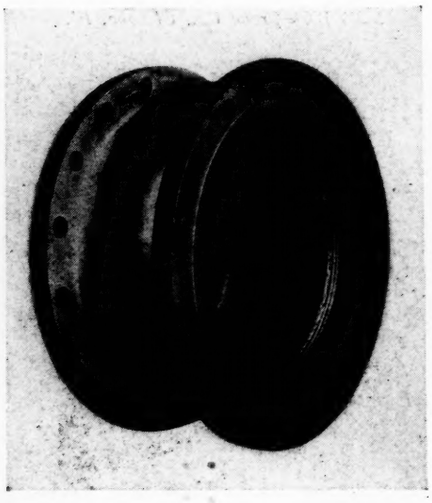
PURPOSE—For providing for expansion in pipe lines.

FEATURES—Steel is used exclusively in this expansion joint. Each joint consists of four essential parts: (1) two forged steel flanges; (2) stainless steel bellows; (3) internal sleeve and limit stops and (4) external sleeve. The bellows assembly consists of thin stainless steel discs welded together, alternately close to the external and internal edges. Each end of the bellows assembly is welded and sealed to the adjacent flange by means of a heavy reinforcing ring. The internal sleeve is a free sliding fit within the flanges and acts as a guide for their movement. A limit stop ring is welded to each end of the internal sleeve and the flanges are counterbored to provide shoulders to engage the limit stops when the joint is fully extended. This prevents over-extension of the bellows and damage to the joint. The external sleeve provides a support for the insulation and prevents foreign material from falling in between the plates of the bellows. Among the characteristics claimed by the manufacturer for this joint are: ample strength to carry high pressures; greater movements afforded due to the flexibility of special stainless steel bellows; no servicing or attention; minimum pressure drop.

TYPES AVAILABLE—For small movements (a maximum of 3/8 in.)—an axial traverse compact expansion joint in sizes from 1 1/2 to 24 in. For large movements up to 8 in.—double movement joints are available. Joints for universal movement are made specially to order to fit specific operating conditions.

LITERATURE AVAILABLE—Bulletin X-37-4.

MADE BY—*Foster Wheeler Corp., 165 Broadway, New York.*



Arco Radiator

NAME—Six-tube Arco radiator.

PURPOSE—A cast iron radiator adaptable to modernization work, or new work where the cost will not permit completely concealed radiators.

FEATURES—Available in three heights of 19, 25, and 32 in., and 3/8 in. in width with 1/2-in. centers.

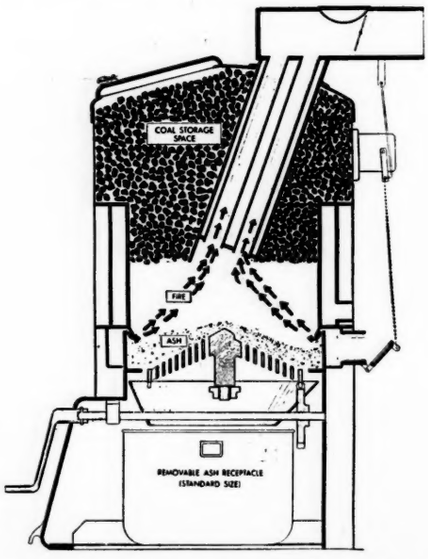
SIZES—Square feet of radiation per section is 2.2, 2.9, and 3.8 for 19-, 25-, and 32-in. radiators, respectively.

MADE BY—*American Radiator Co., 40 W. 40 St., New York.*

Burnham Coal Boiler

NAME—Anthra-Heat magazine feed coal boiler.

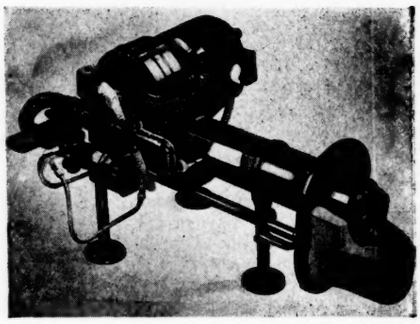
PURPOSE—For heating medium-sized homes with steam or hot water using anthracite.



FEATURES—This boiler was developed in cooperation with the Anthracite Industries, Inc. It has a gravity magazine feed and it is said that one charge of chestnut coal will last for one or two days in cold weather and three to four days in mild weather. The manufacturer claims that a perfectly balanced combustion is secured due to the fact that air is introduced from the sides and flows across the spiral cone-shaped grates. The sides of the boiler and a water-jacketed smoke pipe are used for absorbing heat. The rotation of the grate throws ashes off at the rim and into a removable receiver. Fuel storage, 290 lb.; ash storage, 31 lb.

SIZES AND CAPACITIES—Steam rating, 190 sq. ft.; water rating, 300 sq. ft.; overall height, 53 1/2 in.; overall width, 31 in.; floor space needed, 31 x 26 in.

MADE BY—*Burnham Boiler Corp., Irvington, N. Y.*



Norge Gas Conversion Burners

NAME AND MODEL NUMBER—Norge gas conversion burner No. GB-18.

PURPOSE—For home-heating utilizing gas.

FEATURES—Gas burner has a motor-driven blower for creating positive draft. It is said that complete gas combustion is secured through the conduction of air through three separate tubes, one directly to the flame, one to the outside of the flame, and one to the inside of the flame. Each of these tubes is controlled from the outside, permitting the direction of an exact amount of air to each part of the flame. Safety features include a low-burning gas pilot which operates in six seconds to cut off the gas supply in case a pilot light goes out; a three-step starting gas valve; outside pilot lighter and gas pressure regulator; and a low-voltage thermostat. Gas burner is also available in combination with the Norge Fine-Air furnace.

MADE BY—*Norge Heating and Conditioning Div., Borg-Warner Corp., Detroit, Mich.*

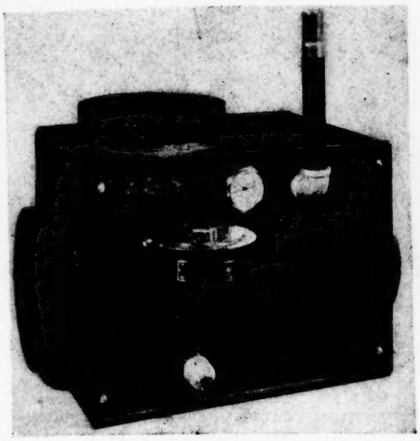
Kewanee Boiler Jackets

NAME—Kewanee Smartline jackets, types Rex, Square-Regal, and Regal.

PURPOSE—Jackets for covering Kewanee round "R" boilers.

FEATURES—Jackets are made of heavy metal and can be easily placed on after the piping has been connected and the boiler insulated. Jackets set on new steel base and have a crinkle finish in a pale green shade with contrasting dark tone corner moulds. The Smartline Rex is for front or rear fired assemblies, the Regal jackets being for complete enclosures of the boiler with any burner.

MADE BY—*Kewanee Boiler Corp., Kewanee, Ill.*



Rochester Humidifier

NAME AND MODEL NUMBER—Rochester humidifier, model HFW.

PURPOSE—For heating and adding humidity to residential buildings utilizing the waste heat in the flue gases.

FEATURES—The unit is designed to be attached at the back of the furnace or boiler ahead of the chimney pipe. Heat from the flue gases evaporates the water and superheated steam is delivered to the bonnet of the furnace. The manufacturer states that it is possible to evaporate up to 25 gal. water daily. Humidifier has a stainless steel evaporating unit with a heating surface of 1400 sq. in.

SIZES AVAILABLE—For 7-, 8-, 9-, and 10-inch stack sizes.

MADE BY—*Rochester Manufacturing Co., Inc., Brighton, Rochester, N. Y.*

Webster-Nesbitt Unit Heaters

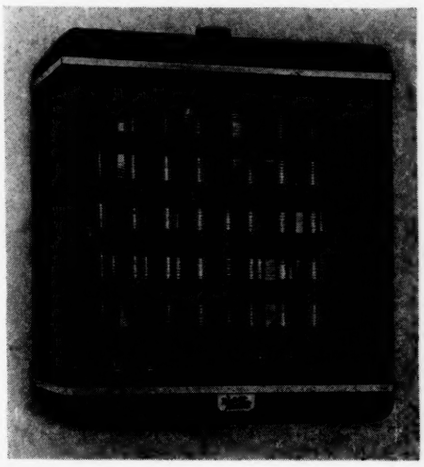
NAME—Webster-Nesbitt unit heaters.

PURPOSE—For heating stores, shops, offices, garages, and like buildings.

FEATURES—Casings are styled to harmonize with modern store and shop interiors but the unit is so constructed that it can be used equally well in industrial applications. Three types of heating elements are available affording a wide range in final temperatures for various air volumes. Heating unit is constructed of copper fins, mechanically forced over ¾-in. seamless, hard-drawn copper tubes. Steam and return headers are of heavy seamless, rectangular steel tubing with connection couplings and tube bosses arc welded to the header body. All assemblies are rated for steam pressures of 150 lb. per sq. in. Steam and return connections are located in the center of the headers permitting the 12, 16 and 20 series units to be supported directly from steam piping. It is recommended that the larger sizes be supported by hanger bolts. Fans are of the four-blade type to handle large volumes of air with minimum noise. Motors are provided with rubber-isolated bases. Discharge louvers are individually adjustable and may be locked into position. Heater is finished in a black featherweave finish with a stainless steel trim.

SIZES AND CAPACITIES—Six sizes with air capacities ranging from 860 to 4950 c.f.m.

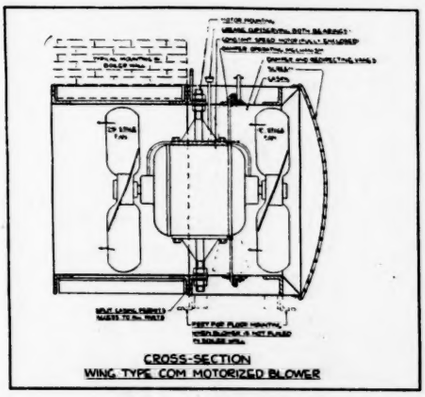
MADE BY—*John J. Nesbitt, Inc., Philadelphia, Pa., and sold by Warren Webster & Co., Camden, N. J.*



Wing Blower

NAME AND MODEL NUMBER—Type COM blower.

PURPOSE—Blowers for supplying air at pressures of 6 or 7 in. of water for forced draft supply in hand-fired boilers, stoker-equipped boilers, oil- or gas-fired boilers or for secondary air supply of pulverized fuel burning boilers.



CROSS-SECTION
WING TYPE COM MOTORIZED BLOWER

FEATURES—Units consist of a constant speed electric motor, an integral damper control, and two propeller type fans, one mounted on each end of the two extended shafts. An air redirecting mechanism is built in between the two propeller fan wheels. The entire assembly is placed within a simple cylindrical casing arranged for ready accessibility. Units are built for either horizontal or vertical mounting and can be installed directly in the brick setting or concrete foundation walls of the boiler.

MADE BY—*L. J. Wing Mfg. Co., 154 W. 14th St., New York.*

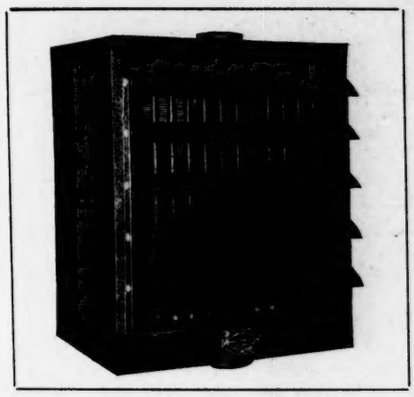
Fairbanks-Morse Anthracite Burner

NAME AND MODEL NUMBER—Fairbanks-Morse anthracite coal burner, model KAR.

PURPOSE—For automatic burning of anthracite coal.

FEATURES—Stoker has a control which automatically regulates the amount of air needed for maximum heat reduction. A spike catcher is located at the juncture of the conveyor tube and the hopper base to prevent any obstructions from reaching the conveyor tubes. This catcher is easily accessible. The retort is designed to provide a fuel bed of the correct shape and thickness for maximum efficiency. It revolves slowly while the stoker is in operation so as to maintain a fuel bed that is spread evenly throughout the firepot. It is said that this eliminates fire cracks and blow holes.

MADE BY—*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago.*



Autovent Unit Heater

NAME—Autovent unit heater.

PURPOSE—A small unit heater for heating small rooms and isolated offices.

FEATURES—This unit has a rating of 61 ft. of equivalent direct radiator surface and a capacity of 14,640 B.t.u. with an output of steam pressure of 60F. A specially designed propeller fan forces 440 c.f.m. of warm air through the adjustable vanes on the front of the heater. Finished in a golden bronze, crackle finish. Motor is suitable for constant or two-speed operation.

MADE BY—*Autovent Fan & Blower Co., 1811-13 N. Kostner Ave., Chicago, Ill.*

Modine Blast Heater

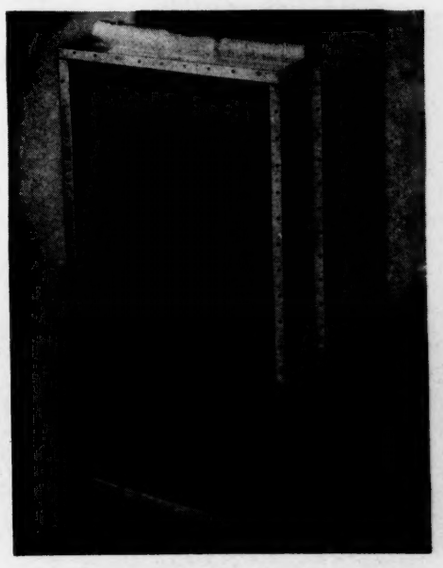
NAME—Modine blast heater.

PURPOSE—For heating, ventilating, air conditioning and process application.

FEATURES—An expansion bend allows each tube to expand and contract as its temperature requires without affecting the tube adjacent to it. The heaters and tubes are cylindrical and seamless for structural strength. Tubes and heaters are brazed into a single unit. All steam-carrying passages of the condensers are of copper or copper alloy. The fins are metallically bonded to the tubes to make a permanent junction. The orificing of tubes is said to have been eliminated by a special steam distributing plate which is designed to ration the steam evenly to all tubes the full width of the condenser.

SIZES AND CAPACITIES—Available in 252 sizes and capacities.

MADE BY—*Modine Manufacturing Co., Racine, Wis.*



Winter Over-heating ..... as Costly

Because manufactured summer comfort has taught the economic wisdom of moderate temperatures, building owners and occupants now seek comfort in *all* weathers.

The Architect and Consulting Engineer can give owners and occupants what they seek through—Comfort Conditioning by DUNHAM.

Based on the fact that steam drops in temperature as vacuum is increased, Dunham Subatmospheric Steam Heating meets the heat requirements of weather with steam adjusted

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Always a center of leading engineering thought, the Dunham Exhibit this year, booth numbers 46 and 47 at the

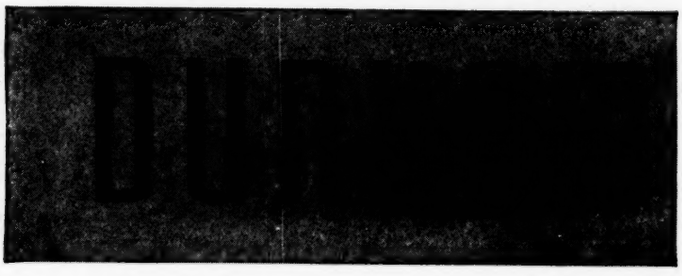
INTERNATIONAL HEATING AND VENTILATING EXPOSITION

will command attention for the premiere of two evolutionary advancements.

Dunham Sav-T-heat for the home.
The Dunham Heating and Cooling Unit.

An interesting phase of the exhibit will be the new "Question and Answer" robot.

The **DIFFERENTIAL** *System*



NEW has happened to heating!

COMFORT CONDITIONING by DUNHAM

Now Recognized Economic Waste

in heat content precisely to heat need. As weather changes — colder or milder — lessened or increased vacuums raise or lower steam temperature and, *steam heat-content always stands in constant balance to heating needs.*

Consequently — when Comfort Conditioning by DUNHAM is installed—full automatic control for the large project, central manual control for the smaller, the same steady, satisfying, mild, healthful temperature which pervades the building, guarantees the satisfaction of occupants in ALL variations of weather - and management enjoys a drastic reduction in fuel or steam costs far below that possible under most skillful operation of "pressure" systems.

C. A. DUNHAM COMPANY
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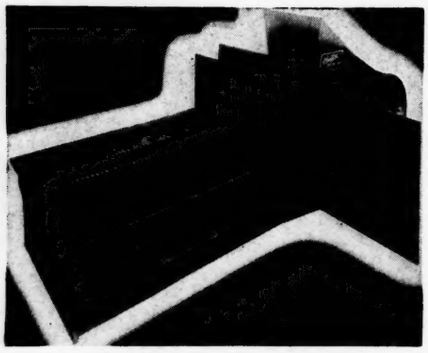
See your Classified Telephone Directory for local Dunham Heating Service.



Canton Underfeed Stoker

NAME—Canton ram type underfeed stoker.

PURPOSE—For automatic burning of coal.

FEATURES—The manufacturer states that this stoker is of the low headroom type and requires 12 in. less headroom than ordinary stokers. Among the special features are the dustproof gear box; anti-friction bearings; motor mounted 24 in. off floor; retort ram adjustable while stoker is in operation; seven feed adjustments; and guarantee for five years.

MADE BY—*Canton Stoker Corp., Andrew Place, SW., Canton, Ohio.*

Kisco Oil-Fired Boiler

NAME—"Dual-Heat" automatic oil-fired boiler.

PURPOSE—For supplying steam using oil as a fuel.

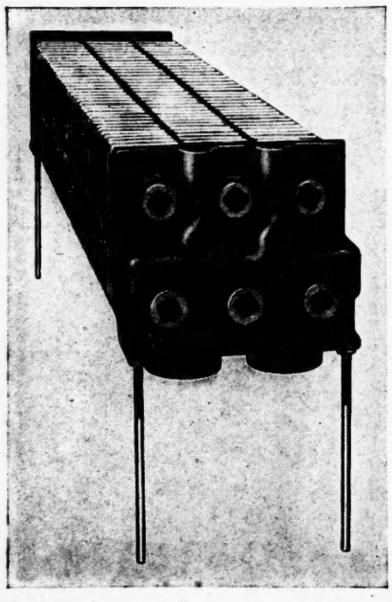
FEATURES—Boiler is especially designed for oil fuel. Incorporated with the boiler is a complete combustion chamber with fire brick lining all ready for the oil burner. A special heating coil in the upper part of the combustion chamber is used to increase the heating surface and shorten the time of steaming. Hot gases from the combustion chamber are circulated around the outside of the boiler, thus heating the water from both sides. Automatic oil burner is supplied complete with automatic ignition and pump cut-out.

MADE BY—*Kisco Boiler & Engineering Co., 4333-35 Duncan Ave., St. Louis, Mo.*

Commodore Hot Water Convector

NAME—Waterflo Convectofin.

PURPOSE—An individual room heating convector for mechanical circulation hot water heating.



FEATURES—There are two rows of tube banks with the fins spaced in staggered relation. The hot water flows in a series circuit through the convector. Convector has copper fins and tubes with the tubes expanded into two cast headers, and supported on legs. Flow and return connections are brought out at the same end. Extra tappings are provided so that either one or both sides of the circuit may be vented.

SIZES AND TYPES AVAILABLE—A number of sizes and styles are available.

MADE BY—*Commodore Heaters Corp., 11 W. 42nd St., New York.*

Condensation Engineering Heat Extractor

NAME—Howle heat extractor.

PURPOSE—For installation between gas-fired heating plants and the chimney to extract the heat from the flue gases and to eliminate condensation.

FEATURES—The unit is designed to remove the heat from the flue gases and radiate it into the basement. A water storage re-evaporator collects the condensate which forms when the gas burner first starts operation and re-evaporates the moisture as soon as the temperature in the heat extractor rises. A downdraft door automatically opens to release the back-draft and closes as soon as it subsides. Unit is constructed of enameling stock iron and finished with a special high temperature vitreous enamel.

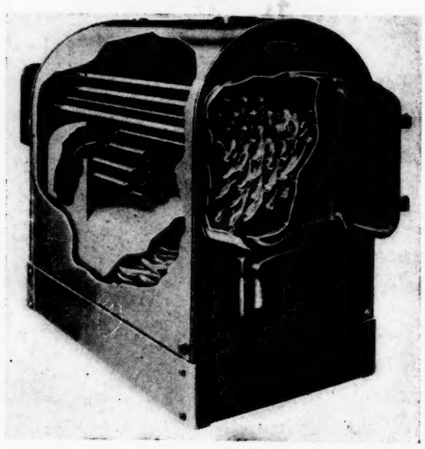
MADE BY—*Condensation Engineering Corp., 333-35 S. Western Ave., Chicago.*

Spencer Steel Boiler

NAME AND MODEL NUMBER—Spencer type "A" steel heating boiler.

PURPOSE—For supplying steam utilizing any type of fuel.

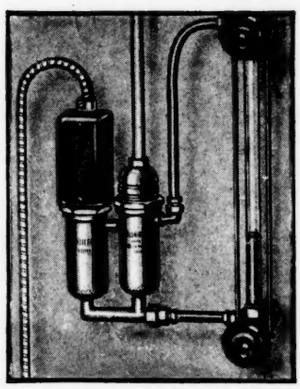
FEATURES — Three-inch tubes provide for



long fire travel and accessibility for cleaning. All tubes may be replaced without removal of the breeching. Doors are of a heavy cast iron and the flue cover doors are heavily ribbed. Tubes can be cleaned through the front flue doors while the boiler is in operation. Manufacturer states that the ease with which changes from one fuel to another may be made is a valuable feature of this boiler. Provision is made for a submerged water heater and either a storage type coil or instantaneous type can be supplied.

CAPACITIES—Steam capacities of 1600 to 7260 ft. (S.H.B.I. rating).

MADE BY—*Spencer Heaters, Division Lycoming Manufacturing Co., Williamsport, Pa.*



Maid-O'-Mist Boiler Protector

NAME AND MODEL NUMBER — Micro Water Boy boiler protector, No. 855.

PURPOSE—For preventing low water or excessive pressure in steam boilers.

FEATURES—This is a combination unit consisting of a Water Boy safety feeder, a Micro boiler protector and the necessary fittings for connection to the water glass. A Micro switch is used as a circuit breaker for both low water and excessive pressure and is rated for ½-hp. motors from 125 to 460 volts a.c. The switch is normally in an open position and is only closed when the float raises and snaps the switch by a compound leverage. A bronze diaphragm in the float chamber prevents water or steam leaking into the switch box. When this diaphragm is subjected to excessive steam pressure it moves upward, breaking the contact with the switch until the pressure recedes. The amount of steam pressure affecting the diaphragm is regulated by a set screw.

MADE BY — *Maid-O'-Mist, Inc., 180 N. Wacker Dr., Chicago.*

Surface Combustion Unit Heaters

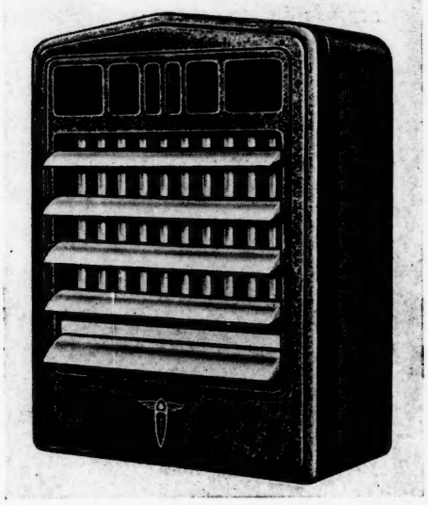
NAME—Janitrol gas-fired unit heaters.

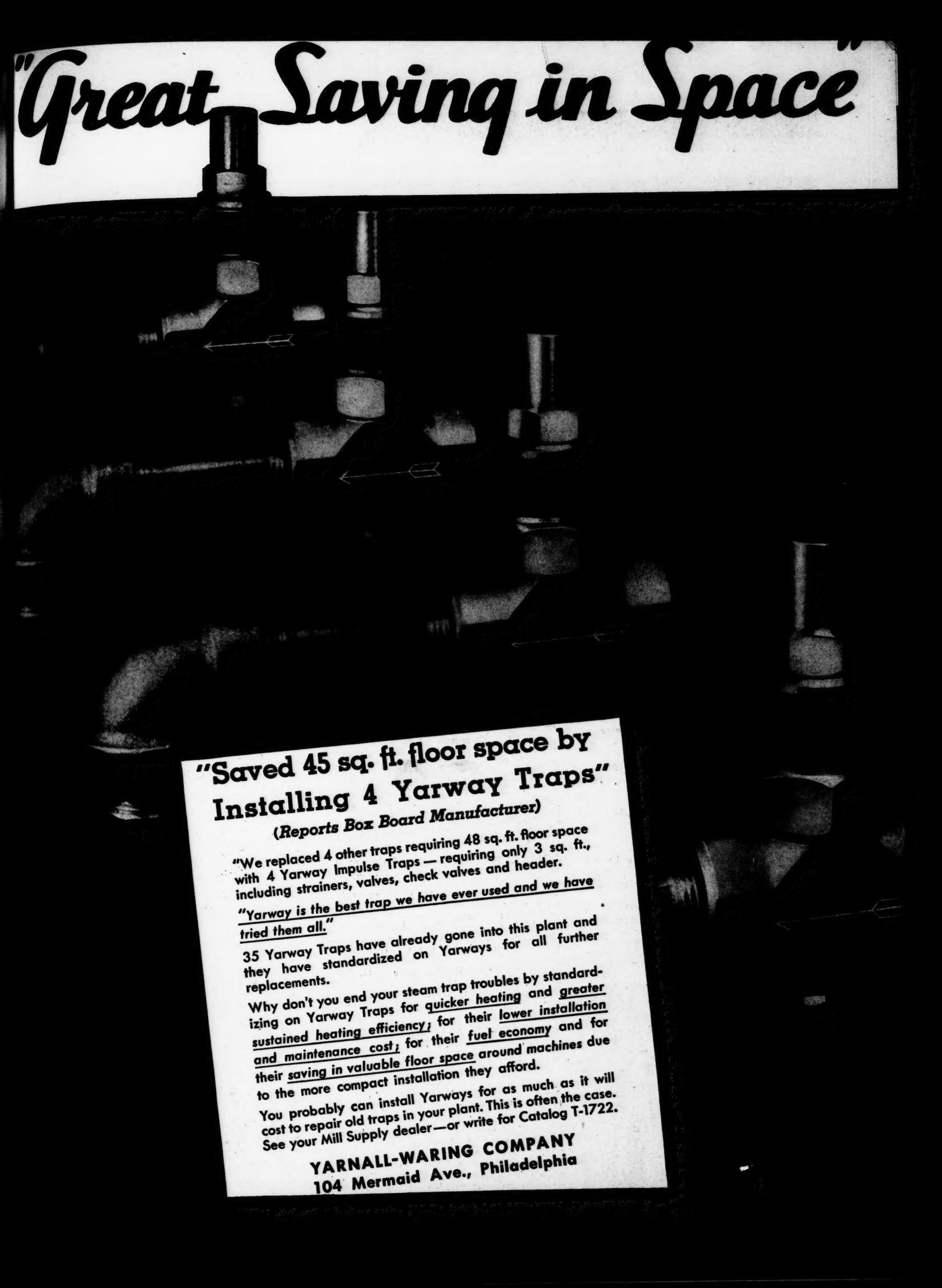
PURPOSE—For space heating using gas.

FEATURES—A new quiet style fan has been adopted so that objectionable operating noises will be eliminated. Many design and construction features have also been modified to reduce the noise. Styled to meet the modern trend with an offset front panel with rounded corners. Casing finish is blue crackle baked enamel with air louvers of aluminum.

SIZES AND CAPACITIES—Eleven sizes ranging from 25,000 to 200,000 B.t.u. per hr.

MADE BY—*Surface Combustion Corp., Toledo, Ohio.*





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"Yarway is the best trap we have ever used and we have tried them all."

35 Yarway Traps have already gone into this plant and they have standardized on Yarways for all further replacements.

Why don't you end your steam trap troubles by standardizing on Yarway Traps for quicker heating and greater sustained heating efficiency; for their lower installation and maintenance cost; for their fuel economy and for their saving in valuable floor space around machines due to the more compact installation they afford.

You probably can install Yarways for as much as it will cost to repair old traps in your plant. This is often the case. See your Mill Supply dealer—or write for Catalog T-1722.

YARNALL-WARING COMPANY
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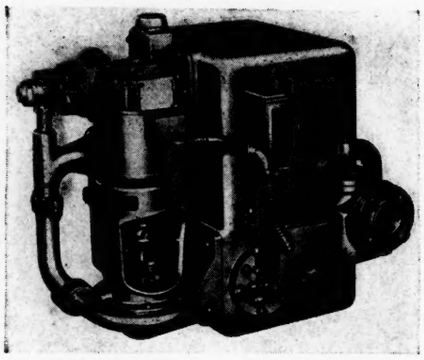


Hoffman Vacuum Pumps

NAME — Hoffman-Economy vertical vacuum pumps, model V-V.

PURPOSE—For exhausting air and water from the returns of steam heating systems.

FEATURES—The centrifugal pump is fitted with enclosed type, non-overloading bronze impeller and has a stainless steel shaft. It has bronze fittings throughout and has renewable bronze wearing rings. The motor is continuous rated at 40C., has ball bearings and is mounted high above the floor as a protection against dirt and water. The receiver is made of cast iron with a double chamber. The lower chamber is the accumulator tank while the upper chamber holds circulating water and also acts as a separator chamber for air and water. A self-cleaning strainer is externally mounted, and a low inlet eliminates need for pit. A complete automatic float and vacuum control with overload protection is provided. It employs a jet vacuum producer.

SIZES AND TYPES AVAILABLE — Four sizes with rated capacities from 2500 to 15,000 sq. ft. e.d.r. Available in both standard capacity for ordinary installations operating between 3 and 12 in. vacuum and special capacity pumps for use where the air capacity or air leakage is greater than average or where higher vacuums (10 to 16 in.) are required.

LITERATURE AVAILABLE—VVP-137.

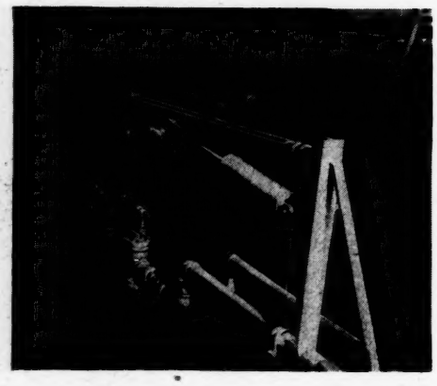
MADE BY—*Hoffman Specialty Co., Inc., Waterbury, Conn.*

Campbell Boiler Feed Water Level Control

NAME—Campbell-Cantilever boiler feed water level controller.

PURPOSE—To maintain boiler water levels to within ½ in.

FEATURES—The control is mounted on the side of the boiler so that it is easily accessible. Frame is set so that the water level mark is at the same level as the desired water level in a column. When the water level drops in the gage glass, water runs down an inclined tube exposing it to the high temperature of the steam at boiler pressure. This causes rapid expansion which is multiplied eight times due to triangular construction. This causes the end casting to move upward, which opens the valve an amount equal to eight times the extent of the expansion. If the water rises in the gage, the cooling action of the cool water rising in the tube causes contraction which lowers the end casting and closes the valve by an amount equal to eight times the contraction. This multiplied principle of contraction and expansion assures sensitive regulation heretofore not available, according to the manufacturer. The action is automatic and requires no manual operation or attention from the boilerman. As an extra safety measure, there can be attached either a whistle or an electric signaling device. The photograph shows the controller mounted on a firebox boiler.



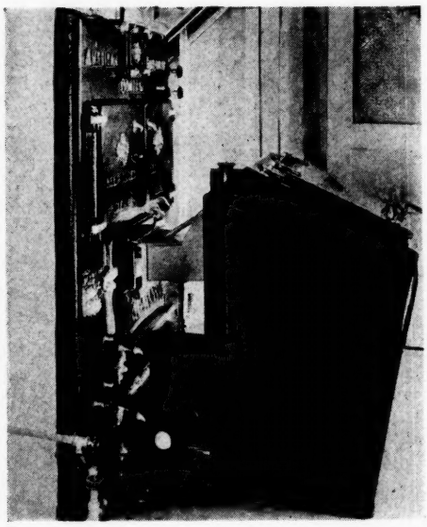
SIZES—Made in one size to meet all boiler needs and to operate any valve up to 12 in.

MADE BY—*J. A. Campbell Co., Box 851, Long Beach, Calif.*

Kirby Overfeed Coal Stoker

NAME—Kirby overfeed coal stoker, portable type.

PURPOSE—For overfeed firing of coal to heating boilers.



FEATURES—This stoker is of the portable type and can be pushed to the coal bin for refilling. The manufacturer states that it is not necessary to remove the grates or firedoor when using this stoker. Coal is distributed over the grate area by means of a special distributor plate which is revolved by a small electric motor. This motor also operates a vertical screw which feeds the coal to the distributor head. The distributor head is adjustable to varying heights of fire doors. Ashes are removed in the usual manner after backing the stoker away from the boiler.

SIZES—All sizes from small home to large industrial installation.

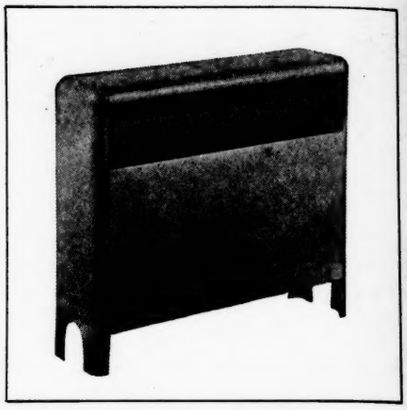
MADE BY—*The Kirby Manufacturing Co., 238 S. Union, Decatur, Ill.*

Young Streamaire Convectors

NAME—Young Streamaire convectors.

PURPOSE — Copper convectors for use with either steam or hot water heating systems.

FEATURES—Large elliptical copper tubes are used in the heating elements of these convectors. The manufacturer states that this shape of tube results in a large area of the tube surface being in contact with the direct air and also makes it possible for the convectors



to be used with one-pipe steam systems as the condensate can flow along the bottom of the tube leaving most of the tube surface exposed to the steam. The extended surfaces on the tubes are stamped from pure copper and are vertically crimped for strength and metallically bonded to the elliptical tubes. The tubes are brazed by a patented process to one-piece malleable iron end tanks which are designed to give even distribution of steam or water to the tubes. Heavy gage steel side plates protect the edges of the fins. The heating element is said to be capable of withstanding an operating pressure of 50 lb. per sq. in. saturated steam, or 100 lb. per sq. in. hydrostatic. A complete line of cabinets for convectors for these heating units is available and includes the following: free standing convector cabinets, wall-hung convector cabinets, partially recessed convectors, fully recessed convectors, and plastered-in concealed convectors.

LITERATURE AVAILABLE — Catalog No. 4037.

MADE BY—*Young Radiator Co., Racine, Wis.*

Kisco Gas-Fired Boiler

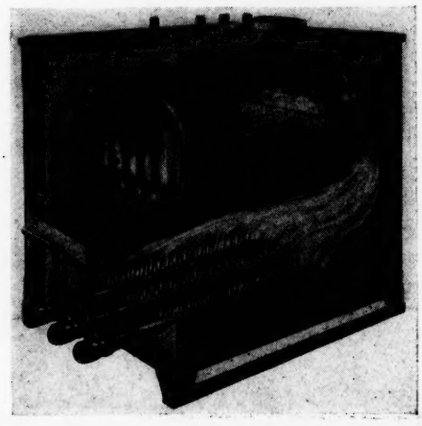
NAME—Kisco gas-fired boiler.

PURPOSE—For supplying steam using gas as a fuel.

FEATURES—All parts of the boiler are exposed to the hot fuel gases. The gases first strike the bottom and sides of the boiler, then travel through the fire tubes and then pass over the top, superheating the steam. A large steam space is provided to assure a continuous flow of dry steam. The boiler is designed especially for gas. It is furnished with all necessary fittings, including burners, gas regulator, try-cocks, water gage set, gas cock, safety valve, blow-down valves, and steam gage. It is furnished completely assembled.

SIZES AND CAPACITIES—Eight sizes varying from 1½ to 15 boiler hp.

MADE BY—*Kisco Boiler & Engineering Co., 4333-35 Duncan Ave., St. Louis, Mo.*



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NEW STANDARDS IN
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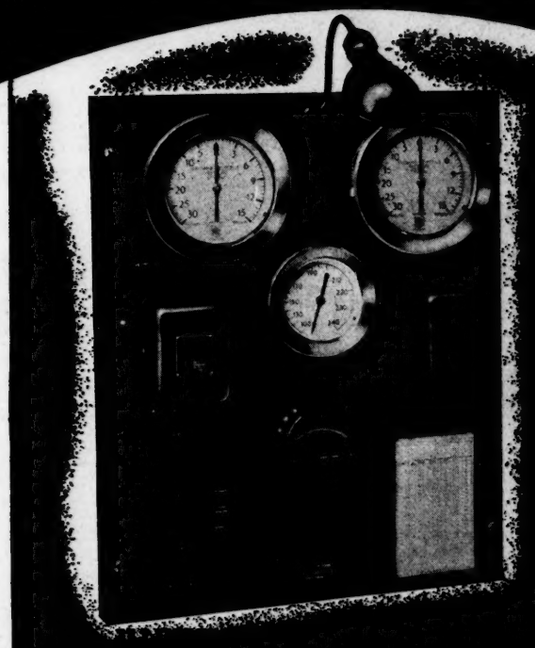

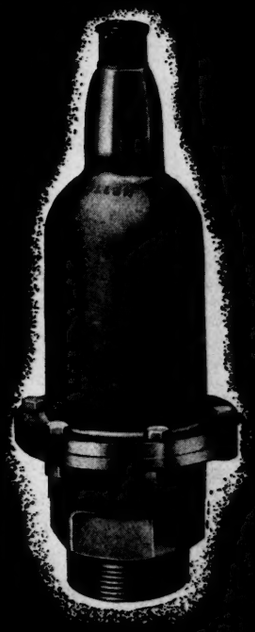

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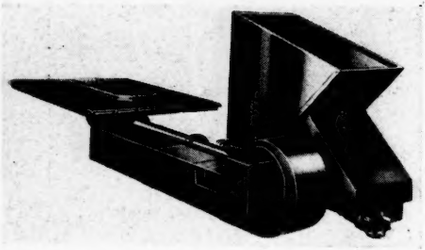


Winkler Commercial Stoker

NAME AND MODEL NUMBER — Winkler Commercial stokers, models 18, 30, 55 and 75.

PURPOSE—For automatic combustion of bituminous coal.

FEATURES—An inter-plan drive which is an internal planetary gearing of the continuous speed type. This drive is said to be silent and has three speeds which are easily changed. Drive belt is adjusted automatically. The fan is direct driven by an electric motor. A locked screw safety release is used to automatically disconnect the transmission from the screw to prevent any damage when an obstruction is in the screw. A relay automatically reconnects the transmission and screw when the obstruction is removed. A light or ringing bell is used to give notice of the locked screw. An automatic air volume regulator controls the air volume by holding the velocity in the air tube at a predetermined value.

SIZES AND CAPACITIES—Burning capacity ranges from 180 to 825 lb. of coal per hour.

MADE BY — *Winkler Manufacturing Corp., Lebanon, Ind.*

Fedders Unit Heater

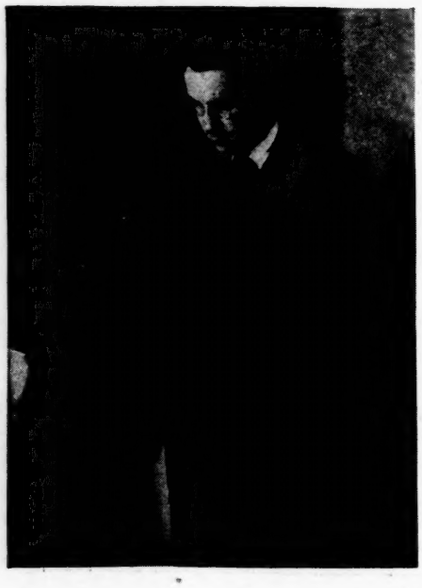
NAME AND MODEL NUMBER—Fedders unit heater, model 3023, series 3.

PURPOSE—A small size unit heater for small offices, gasoline stations, and other similar size installation.

FEATURES—Model follows the same design as the larger Fedders' models with the cabinet finished in a brown morocco-like texture. Element is mounted in cabinet by means of a full-floating mounting which is said to eliminate expansion stresses between the element and cabinet.

SIZES—75 sq. ft., e.d.r.

MADE BY—*Fedders Manufacturing Co., Inc., Buffalo, N. Y.*



Sarco Bucket Trap

NAME—Sarco bucket trap.

PURPOSE—A steel trap of the converted bucket type. Manufacturer states that this trap was designed to complete the company's line and is not intended to compete with very light, low-priced units.

FEATURES—Trap uses the same type of valve mechanism as the other Sarco float-thermostatic traps. It can be furnished with an integral air bypass carried inside the bucket and consisting of a thermostatic trap element of the balanced pressure type. It is said that the air bypass never requires resetting and operates satisfactorily regardless of pressure fluctuations in the trap. Available with bodies of cast iron for pressures up to 125 lb., semi-steel for pressures to 250 lb., and cast steel for pressures up to 500 lb. Valve heads and seats are of stainless steel.

SIZES AVAILABLE—½ to 2 in.

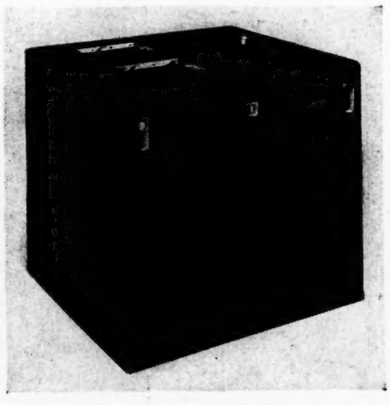
MADE BY—*Sarco Co., Inc., 183 Madison Ave., New York.*

American Radiator Large Home Air Conditioner

NAME AND MODEL NUMBER—American Radiator large home air conditioner, Nos. 301B and 1101B.

PURPOSE—Air conditioner of the upright type for large homes to operate with steam or hot water heating systems.

FEATURES—Unit is made in two models—the one 301B is self-contained in a chrome green jacket with a chromium trim and is built to stand on the floor beside a heating boiler, while the other, 1101B, is combined with the company's No. 11 oil boiler in a single jacket of plum color with copper trim. Units are designed with capacities up to 1850 c.f.m. and can be used for part air heating in the home. Air passage through the conditioner is U-shaped with a two-pass heating coil used across the unit for warming the air. Viscous type filters are used for air cleaning while humidity is supplied through a spray type humidifier operated against an adjustable target by a solenoid valve. A centrifugal blower is used to circulate the air. Warm water is

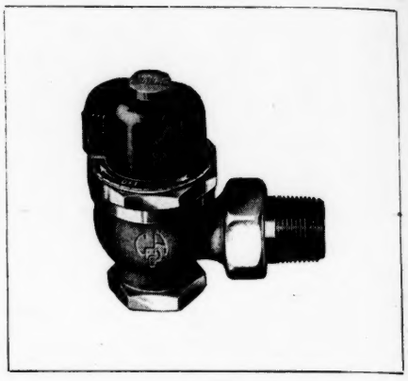


No. 1101B Model A. C.

used in the heating coil of the conditioner with both steam and warm water heating system. In the case of the steam boiler the water is drawn out of the boiler to a pipe connected below the water line. A small pump is used to provide circulation of the water. One motor drives both fan and pump.

CAPACITIES—Both units are capable of giving an equivalent of 500 sq. ft. of direct steam radiator surface.

MADE BY — *American Radiator Co., 40 W. 40th St., New York.*



Dunham Steam Valves

NAME—Dunham Orifex valve.

PURPOSE—A radiator valve with an adjustable orifice.

FEATURES—This valve provides a means of changing the size of the orifice without disconnecting it from the radiator. A calibrated guide surrounds the stem. Adjustments are provided for in increments of 1 sq. ft. A removal of the button from the top of the handle makes the adjustment stem accessible. The valve need only be turned on or off since it is the orifice within the valve and not the position of the handle which controls the steam flow.

MADE BY—*C. A. Dunham Co., 450 E. Ohio St., Chicago.*

Surface Combustion Winter Air Conditioner

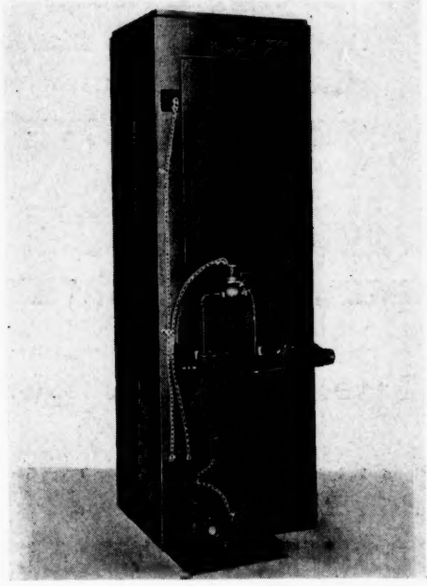
NAME AND MODEL NUMBER—Janitrol gas-fired winter air conditioner, type BC.

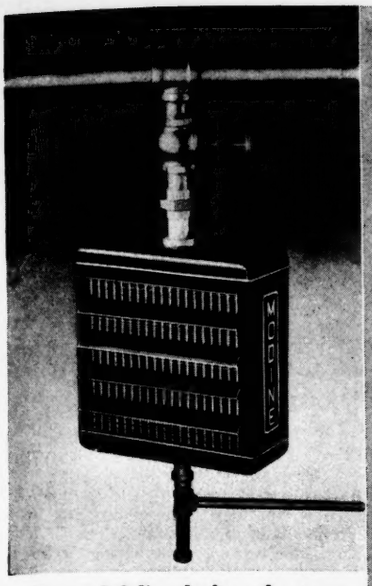
PURPOSE—For heating low cost housing projects and individual apartments.

FEATURES—In view of the fact that many installations of these units will be in service closets or in other locations where space is limited, the depth and width have been kept at a minimum. A squirrel cage blower is used to circulate the air. Various combinations of controls, humidifying equipment and filters are offered with the new unit.

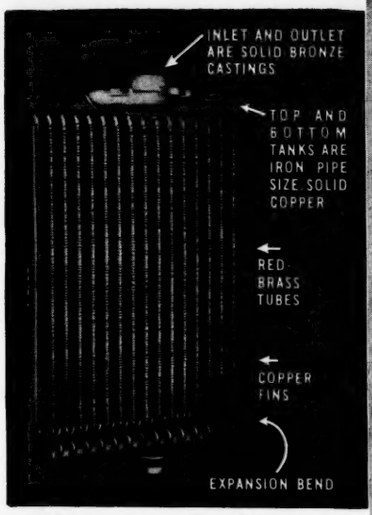
SIZES AND CAPACITIES—Two sizes—45,000 and 90,000 B.t.u. per hr. input.

MADE BY—*Surface Combustion Corporation, Toledo, Ohio.*

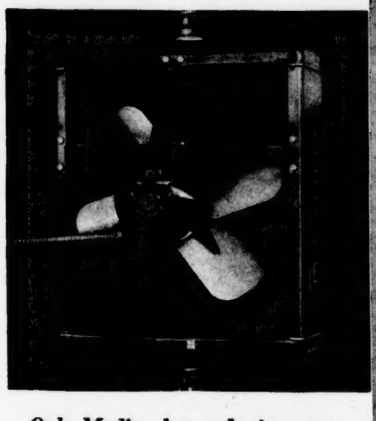




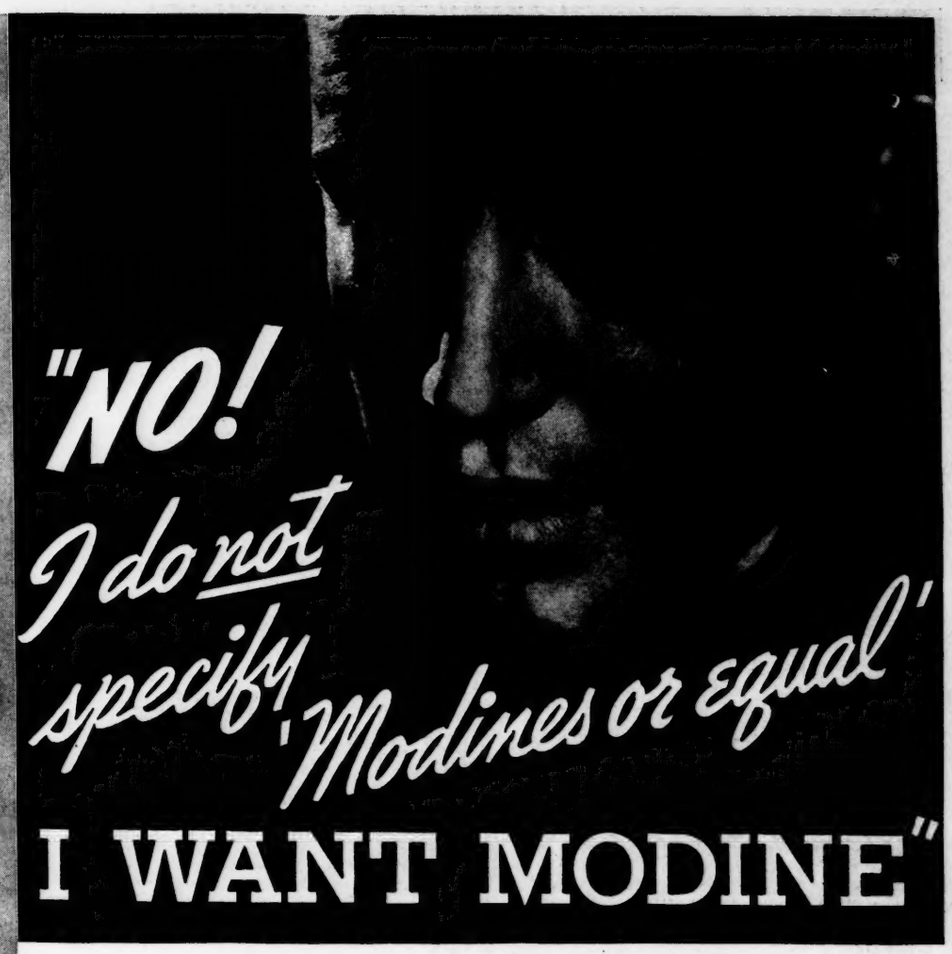
Suspended directly from the steam line, without brackets, rods or straps . . . a Modine patented feature . . . Modines cost less to install.


INLET AND OUTLET ARE SOLID BRONZE CASTINGS
TOP AND BOTTOM TANKS ARE IRON PIPE SIZE SOLID COPPER
RED BRASS TUBES
COPPER FINS
EXPANSION BEND

Inlet to outlet, the Modine condenser is all copper or copper alloy. All steam-carrying passages are cylindrical for excess strength. Metallic bonding prevents possibility of reduction of heat transfer from tubes to fins.



Only Modine has velocity generators, directing and controlling the air stream, producing greater heat throw without increasing power requirements.



"NO! I do not specify 'Modines or equal' I WANT MODINE"

THE UNIT HEATER THAT IS IN A CLASS BY ITSELF

● **"All men are created equal"—but unit heaters are *not*. There are unit heaters—and there are *Modines*. Advanced in design . . . improved in construction . . . proved in performance—Modines offer many outstanding advantages that simply do not exist in other unit heaters.**

Modines are infinitely stronger materially and structurally . . . and more effective in heat transfer. The all-copper condenser is built to withstand high steam pressures and temperatures *without leaking*. Its *expansion bend* construction . . . a development *exclusively Modine* . . . permits free individual knee-joint expansion and contraction of each tube independently of the others.

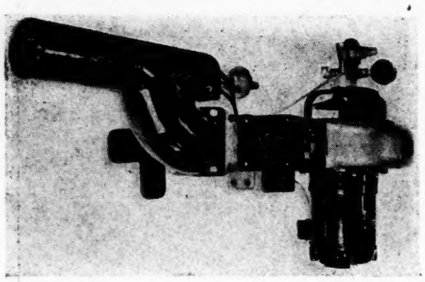
Modines heat faster, distribute heat more thoroughly and evenly . . . direct it exactly where needed to keep floors and working zones comfortable. No cold spots or drafts. Fuel savings alone are 25 per cent and more. Find out why *more Modines are being sold than any other unit heater.*

Write for Catalog 236.

MODINE MANUFACTURING COMPANY
1720 RACINE STREET RACINE, WISCONSIN

HEATING, COOLING AND AIR CONDITIONING EQUIPMENT FOR INDUSTRIAL, COMMERCIAL AND RESIDENTIAL APPLICATION

VISIT BOOTH 93 AT THE HEATING SHOW



Scott-Newcomb Oil Burner

NAME—Conversion oil burner, model CJL.

PURPOSE—Designed to burn oil from 7 to 12 gal. per hr.

FEATURES—Pump has no gaskets and operates with a dual seal. Air adjustment is made so that an extremely fine adjustment can be had and an acoustical material is located in the air receiver to reduce combustion and spark noise. Four fuel screens are used, one large screen in the line, one at the entrance of the cut-off valve, and one just before each nozzle. A gyro dual air mixer is employed.

CAPACITIES—7 to 12 gal. of oil per hr.

MADE BY—*Scott-Newcomb, Inc., 1922 Pine St., St. Louis, Mo.*

Minneapolis-Honeywell Circulator

NAME AND MODEL NUMBER—Minneapolis-Honeywell water circulator, Types M401 and M403.

PURPOSE—To increase circulation on hot water heating systems.

FEATURES—The device may be used to speed up circulation alone or in conjunction with a Minneapolis-Honeywell flow valve to provide fully automatic summer-winter hot water control. Some of the features include a packless seal which is said to prevent oil from entering the water or vice versa, a standard built-in thermal overload cut-out, stainless steel drive shaft, bronze bearings and a long lasting oil supply.

SIZES—To fit 1, 1½, 2, and 3 in. pipes. 110 volts, 60 cycle motors are standard with other voltages, cycles and currents available.

MADE BY—*Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.*

Babcock & Wilcox Firebrick

NAME—Insulating firebrick.

PURPOSE—For fireboxes in house-heating furnaces and boilers.

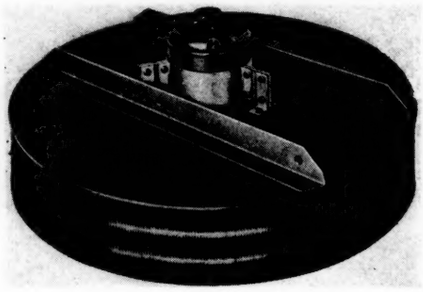
FEATURES—The texture of the face of the brick and the brick's porous structure make it, according to the manufacturer, an effective sound-deadening material approximately equal to acoustic plastic in its ability to absorb sound and reduce reverberation in the furnace. The manufacturer also claims a fuel saving and a reduction of the soot hazard through the use of this brick in the combustion chamber of oil-fired furnaces and boilers.

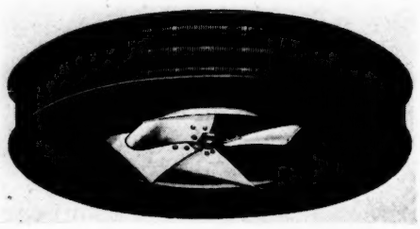
MADE BY—*The Babcock & Wilcox Co., 85 Liberty St., New York.*

Trane Projection Type Unit Heater

NAME—Trane projection type unit heater.

PURPOSE—For all space heating applications, such as factories, sales rooms, garages, offices, laboratories, etc.



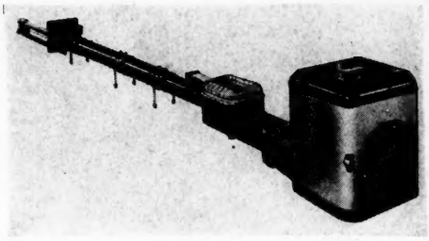


FEATURES—In large spaces, especially those with considerable height, there is difficulty in preventing excessive temperature at ceiling when room temperatures at breathing zone are at desired level. This can be overcome with high velocity emission of heated air but this has previously not been accomplished as it is difficult to diffuse the air stream and carry it considerable distance at the same time. This unit is said to accomplish these purposes in a way not hitherto attempted.

The unit consists of upper and lower plates which are installed in a horizontal plane; the upper plate being solid, the lower with a large orifice which acts as a fan outlet. Between the peripheries of the two plates is a two-row circular heating coil. The ambient air is drawn through the coil at a low velocity and then projected straight downward to the floor by the four-blade propeller fan. After leaving the fan outlet, the air stream diverges so that when it reaches the floor there are no noticeable drafts and as it moves downward it induces a volume of air which results in a gradual temperature drop. The motor is mounted on a three-point resilient construction to prevent motor noises being transmitted to other metal parts. It also keeps motor out of the air stream. Motors are provided with ball bearings and have lubrication which need not be serviced during heating season.

LITERATURE AVAILABLE—Bulletin 284

MADE BY—*The Trane Co., 2005 Cameron Ave., La Crosse, Wis.*



Holcomb & Hoke Stoker

NAME—Bin-Feed FireTender.

PURPOSE—For automatic firing of coal from bin.

FEATURES—Special cleanout opening is provided in the worm housing to give access to the point where large objects which work their way into the worm housing can be easily removed. Transmission, motor and fan unit are completely enclosed in a container insulated with sound-absorbing material. A variable pitch feed screw is used. Transmission has only two gears and is lubricated by a flow of oil from a top reservoir. An automatic switch disconnects the motor in case of obstruction in feed screw. Controls include low voltage thermostat, relay, limit control and hold-fire control. Feed worm is cast of high grade alloy steel.

CAPACITY—Coal burning capacity ranges from 12 to 35 lb. per hr.

MADE BY—*Holcomb & Hoke Mfg. Co., Indianapolis, Ind.*

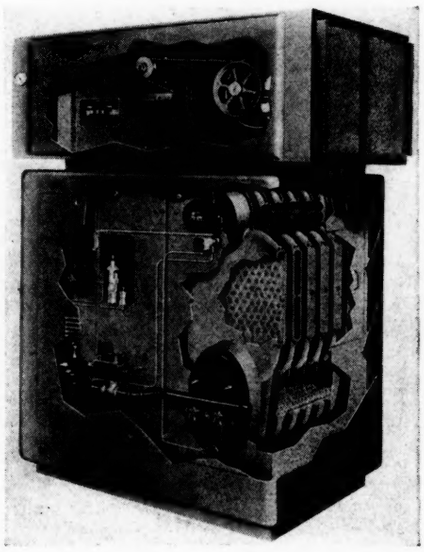
AGP Gas-Fired Conditioner

NAME AND MODEL NUMBER—AGP gas-fired air conditioner, type 2-FE.

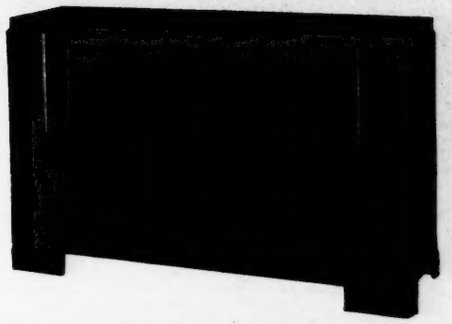
PURPOSE—For heating, humidifying, filtering and circulating air.

FEATURES—This winter air conditioning unit operates on a counter-flow principle. The fan unit, mounted on top, blows air down over the heating surface in counter-flow to the upward passage of the products of combustion on the other side of the heating surface. The manufacturer states that this counter-flow principle increases the rate of heat transfer from metal to air and reduces the weight and size of the heating sections. Extended pin heating surfaces are used on the inner flue surfaces. A single combustion chamber is used for all sizes. All of the controls are concealed within the casing of the unit.

MADE BY—*American Gas Products Corp., 40 W. 40th St., New York.*



A Low Cost Air Conditioner System



Has a tailored cabinet finished in burl walnut and velvet black enamel. Takes place of a radiator. Needs no ducts. Connects to regular heating pipes.

Does Everything A High Cost One Does

1. It filter-cleans the air. Warms it. Humidifies it. Circulates it.
2. Requires no ducts. Needs no extra equipment in basement. No cutting of floors or walls.
3. Works equally well on any old or new system of radiator heat, either steam or water.
4. Conditioner takes place of a radiator and occupies about the same space. Can be free-standing, and either partly or entirely recessed. Has 80 sq. ft. heating capacity. Two units will humidify a 6 to 7 room house.
5. Equipped with both thermostatic and hand controls. Fan can be run in Summer to circulate dead heavy air.
6. Can be installed by any average heating mechanic.

See our Display in Booths 233 and 234 at the Heating & Ventilating Show, Grand Central Palace, New York City, January 24th to 28th inclusive.

Complete Information
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Manufacturers of Heating Equipment Since 1873
IRVINGTON, N. Y. - ZANESVILLE, OHIO
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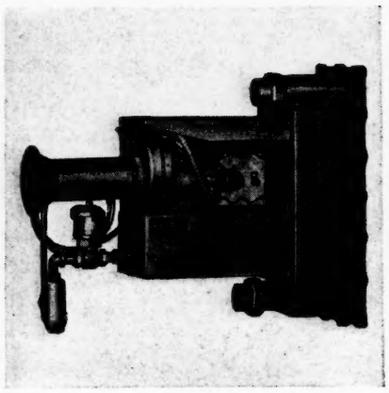
Burnham Boiler



American Radiator Boiler Humidifier

NAME AND MODEL NUMBER—American Radiator boiler humidifier, Nos. 10 and 11.

PURPOSE—A humidifying boiler attachment for supplying moisture to room air without the use of ducts.

FEATURES—Humidifier supplies moisture to the house through a 3-in. pipe and is made in two different models; one, the No. 10, for attachment to any boiler and the other, No. 11, is constructed as an integral part of the hot water heater in the company's No. 11 oil burning boiler. It is said that heat exchangers are employed in both models so that superheated water vapor is supplied. Manufacturer states that super-heating the water vapor and warming the air that supplies it, prevents condensation in the pipe and at the outlet grille and at the same time makes it possible to handle a sufficient volume of moisture to meet the needs of the entire house.

METHOD OF OPERATION—A fine stream of water is played against a heated cast iron surface through a spray nozzle which is operated either manually or automatically by a solenoid valve. Air circulation is provided by a small blower that has a capacity of 40 c.f.m. Humidifier is intended to evaporate approximately 12 gal. of water per day and can be used on either steam or hot water boilers.

MADE BY—*American Radiator Co., New York.*

Sterling Vacuum Pumps

NAME AND MODEL NUMBER—Sterling type S, series 200, 300, and 400 return line vacuum heating pumps.

PURPOSE—For removing air and condensate from heating system.

FEATURES—This pump is of the water ejector vacuum producer type. Pressure developed in the discharge line of the pump forces water through the ejectors at high velocity, causing air to be drawn into the ejector from the chamber surrounding the jets. The vacuum thus produced lifts air and water from the accumulator chamber of the pump receiver. The vacuum producer consists of a cast iron casing into which a number of bronze jets mounted in a bronze plate are assembled. These jets are located slightly in front of a similar number of bronze tubes of the venturi type also mounted on a bronze plate. The vacuum pump has only one moving part outside of the motor, the rotor of the pump itself. The cast iron receiver is divided into two compartments by a partition. The lower receiver acts as an accumulator for the air and water from the returns of the heating system. The upper receiver is a separating chamber where the air is liberated to the atmosphere and the water is held in storage to be again circulated through the vacuum pump and producer.

TYPES AVAILABLE—Simplex and duplex design with and without separate accumulator tanks. All sizes of units up to and including 40,000 sq. ft. of steam radiator surface have accumulator tank built into the pump receiver. Sizes of 40,000 sq. ft. and larger are built with separate accumulator tanks. Separate accumulator tanks are only required with standard designs of pumps up to and including 40,000 sq. ft. when the return line is lower than the inlet to receiver.

MADE BY—*Sterling Engineering Co., Milwaukee, Wis.*

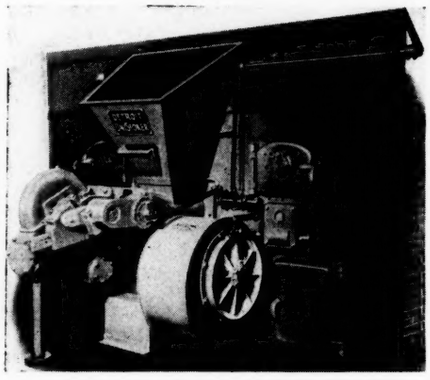
Newark Low Water Cut-Off

NAME—Low water cut-off.

PURPOSE—A low water cut-off designed to eliminate vacuum difficulties and to shut off on low water up to 17 lb. pressure.

FEATURES — The new cut-off is compact, measuring only 8 x 4 x 3¼ in. It is said to have an unequalled accessibility, uses a new bellows type control and is made of steam bronze metal throughout.

MADE BY—*Newark Boiler Regulator Co., 15 Ward St., Bloomfield, N. J.*



Detroit Adjustable Stoker Feed

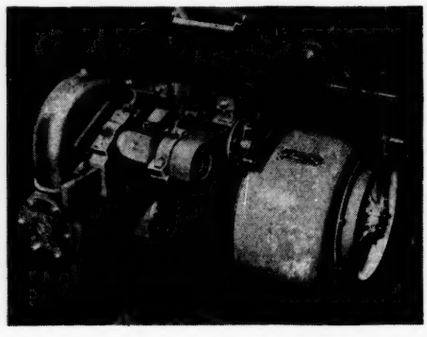
NAME—Detroit adjustable stoker feed.

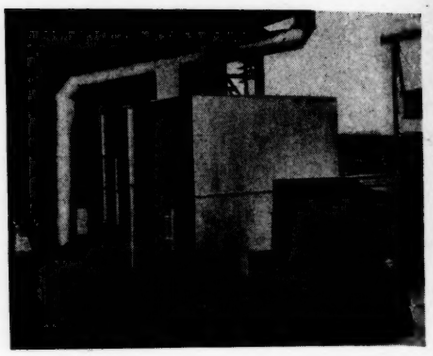
PURPOSE—For controlling the stoker fuel feed to the furnace over a range from zero to maximum capacity.

FEATURES—The adjustable feed is built into the right-hand crankshaft bracket of the Detroit single retort and Detroit UniStokers. It may be applied to existing installations when desired. It may be either manually or automatically operated. If automatically operated, the master regulator which is connected to the Detroit Adjustable Feed may also be connected to the damper at the fan inlet or outlet, so that the air supply is synchronized with the fuel feed, as required by changes in load on the boiler, as indicated by steam pressure variations. The master regulator may also be connected to the boiler uptake damper if desired.

AVAILABLE ON—New or existing Detroit single retort and UniStokers.

MADE BY—*Detroit Stoker Co., Detroit.*





Smith Automatic Air Unit Heater

NAME—Smith automatic coal-fired air heater.

PURPOSE—For oven, process, or space heating.

FEATURES—Heater consists essentially of a combustion chamber to which coal is automatically fed by a stoker. Stoker is of the underfeed screw type with one motor driving both fan and worm screw. Motor is controlled by a thermostat in the warm air discharge. Combustion chamber is encased in heavy steel with the upper part of the walls and the top arch heavily insulated. The lower part of the walls is air cooled. The heat interchanger is built of heavy rectangular steel tubes and the gases flow through it on the counter flow principle. An automatic bypass damper is provided so that the flue gases can be bypassed around the heat interchanger if for any reason the fan handling the flue gases or the supply fan handling the air through the interchanger tubes stops.

METHOD OF OPERATION—Flue gases from the combustion chamber pass through a heat interchanger and from there to a gas exhaust fan which forces the flue gases to a chimney. The air to be warmed is forced by a fresh air supply fan through the heat interchanger in an opposite direction to the flue gases. It is possible to have air leaving the heater at 700F. When the unit is used for drying or baking purposes and it is desired to have 700F air, the air makes four passes through the interchanger. If the unit is used for space heating or low temperature drying, the air makes but one pass through the interchanger.

MADE BY—*James Campbell Smith, Inc., 16374 Euclid Ave., Cleveland, Ohio.*

Worthington Boiler Feed Pumps

NAME — Improved high pressure multistage centrifugal boiler feed pumps.

PURPOSE—A boiler feed pump for pressures up to 1200 lb. per sq. in.

FEATURES—An even number of impellers facing in opposite directions serve to equalize the action of forces and eliminate balancing drums or disks. In addition, large thrust bearings are provided to insure long life and reduce maintenance costs. A staggered volute construction effects radial hydraulic balance so as to reduce wear or internal clearance and to eliminate stuffing box troubles. Other improvements are an internal interstage loop casing, shaped to prevent erosion and eddy currents and heavy oil-lubricated ball bearings mounted in dirtproof housings. Horizontally-split casing permits the pump to be taken apart for inspection or repair.

SIZES AND CAPACITIES—Made in three sizes from 4 to 8 in., for capacities ranging from 200 to 1500 g.p.m., for pressures up to 1200 lb.

LITERATURE AVAILABLE—Bulletin W-318-B7A.

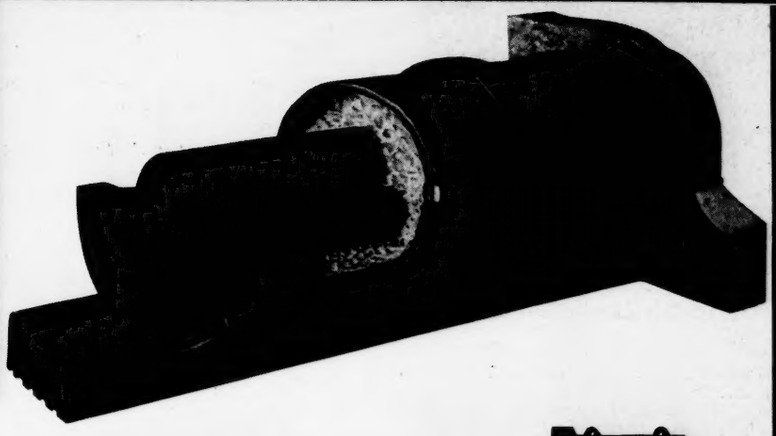
MADE BY—*Worthington Pump and Machinery Corp., Harrison, N. J.*

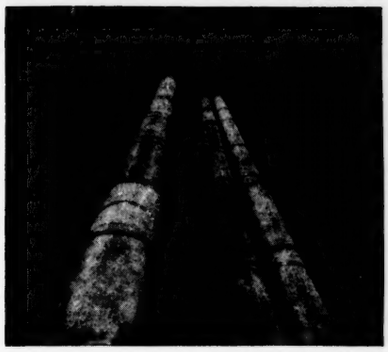
SIMPLIFY

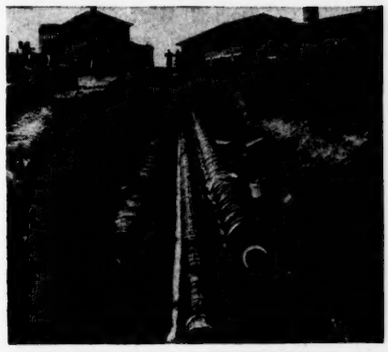
your Heating and Piping Problems with

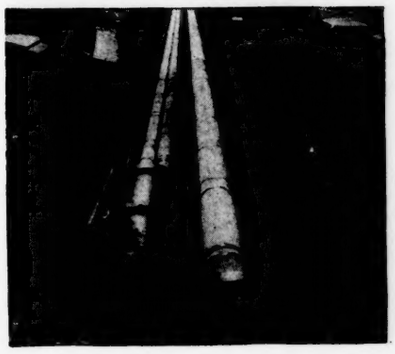
ADSCO PRODUCTS

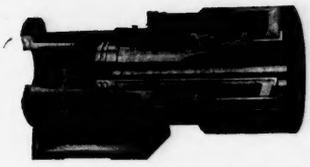
EXPANSION JOINTS, CASING TILE CONDUIT, STEAM TRAPS GLASS FILLER INSULATION

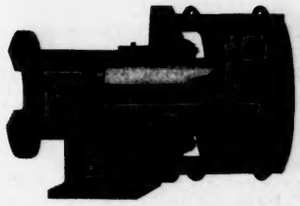












A COMPLETE LINE OF DEPENDABLE STEAM DISTRIBUTION EQUIPMENT

ADSCO offers a complete line of steam distribution equipment with these important advantages: (1) factory co-operation in solving your steam line problems, (2) dependability in equipment based on over 60 years engineering experience, (3) equipment that is easy to install, efficient in operation and reasonably priced, (4) a complete line from a single buying source, involving less clerical work without shipping delays.

When you specify, requisition, or purchase ADSCO steam line products, you are assured of high quality equipment, tested and proven through years of successful service by hundreds of public utilities, industrial plants, colleges, hospitals, railroads, and steamship companies in the United States and Canada.

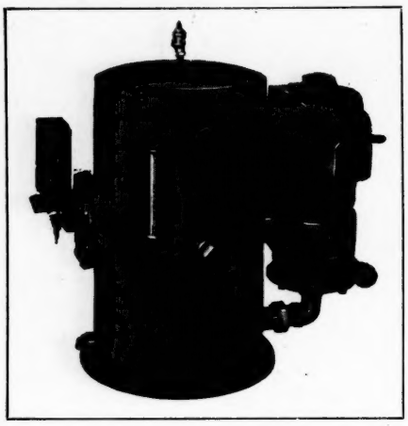
Among the new ADSCO products, we call your attention particularly to the ADSCO-Bannon Tile Conduit for underground steam lines. It combines strength, simplicity and durability in a salt-glazed, vitrified conduit. It has found instant favor with the trade to the extent that thousands of feet of it are now in service. Request a copy of Bulletin No. 35-67AJ on ADSCO-Bannon Tile Conduit and add our name to your inquiry list when in the market for tile conduit.

Write for the complete ADSCO Catalog No. 35J.

AMERICAN DISTRICT STEAM COMPANY

NORTH TONAWANDA, N.Y.

IN BUSINESS OVER SIXTY YEARS



Goulds Condensate Pump

NAME—Condensate return outfits.

PURPOSE—For automatically returning condensate from steam radiators and other steam using equipment to low and high pressure boilers.

FEATURES—Condensate is collected in a receiver from which the pump forces it back to the boiler. The manufacturer states that care has been exercised to utilize properly sized receivers so that the water level is not seriously affected. All pumps are either reciprocating or centrifugal, depending on the rating of the equipment. Units are complete with motor with full overload and low voltage protection. All receiver tanks are of rust-resisting, copper-bearing steel. A two-pole float switch with a copper float automatically starts and stops the pump according to the water level in the receiver. Provision for automatic feed water makeup with boiler level control can also be furnished with these outfits. When equipped with this device the outfit will automatically furnish fresh makeup water as well as return to the boiler such condensate as may be available.

SIZES AND CAPACITIES — For handling systems up to 40,000 sq. ft. of radiator surface and boiler pressures up to 120 lb.

MADE BY — *Goulds Pumps, Inc., Seneca Falls, N. Y.*

Gorton Air Eliminator

NAME—Gorton high pressure air eliminator.

PURPOSE—For automatically venting steam coils, traps, and like equipment operating under pressures up to 150 lb.

FEATURES—The operating member is made of a special non-corrosive metal which is sensitive to heat changes. It is designed to close the valve at 212F and to keep it closed until the temperature drops below that point when it automatically opens the valve. The manufacturer states that the eliminator can be used on all pressure lines or equipment requiring automatic and quick air elimination under pressures up to 150 lb. The body of the device is made of bronze and is nickel plated.

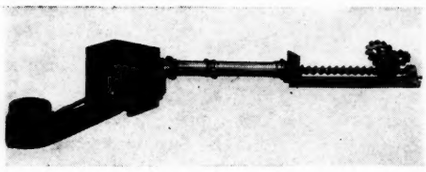
SIZE—2½ in. diameter with ½ in. bottom pipe connection. Air outlet size, 3/16 in. diameter.

MADE BY—*Gorton Heating Corp., Cranford, N. J.*

Iron Fireman Feed Unit

NAME—Swivel-type automatic feed unit for coal stokers.

PURPOSE—A swivel worm-conduit for stoker coal which permits the location of the coal bin anywhere within a 180° arc in front of the burner unit.



FEATURES—Previous automatic feed conduits required installation of the coal bin in direct line with the burner. This new swiveled worm-conduit makes it possible to install the coal bin at any angle within 180°.

MADE BY—*Iron Fireman Mfg. Co., Cleveland, Ohio.*

Peerless-Bellamy Conversion Burner

NAME—Peerless-Bellamy radiant gas burner.

PURPOSE—For converting boilers and furnaces to gas fuel.

FEATURES—Burner is said to produce a large amount of radiant heat. Burner head consists of a cast iron manifold with internal cast iron supports for a series of refractory

burner elements and is of such a size that it need not be taken apart for passing through firebox door when installing or removing. Refractory elements are fastened to the manifold with toggle bolts that can be easily removed. The manufacturer states that the flue gas temperature increases 60F every minute during the initial 5-min. operation. This is said to tend to eliminate condensation.

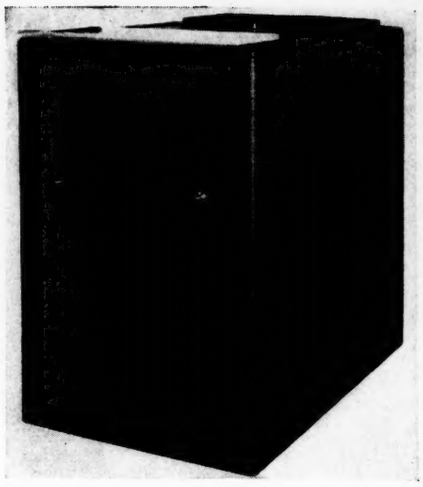
SIZES AND CAPACITIES—Available in five sizes with heat inputs of 90,000 to 300,000 B.t.u. per hr. for 3 in. of gas pressure.

MADE BY—*Peerless Manufacturing Corp., Louisville, Ky.*

Bryant Winter Air Conditioner

NAME AND MODEL NUMBER—Winter air conditioner, model AC-78.

PURPOSE—For heating, cleaning, circulating, and humidifying air.



FEATURES—The entire heating unit is built of cast iron and is enclosed in a special inner cabinet. Filtered air passes through this cabinet under pressure and is heated and humidified before it is circulated through the house. The space between the inner and outer casing is under a vacuum. This is said to result in a higher heating efficiency and low heat radiation loss to the basement. A special flue economizer is used to increase the efficiency. Filters are used for cleaning. Air is circulated by means of a centrifugal blower.

SIZES—Made in six sizes with input ranging from 100,000 to 364,000 B.t.u. per hr.

MADE BY—*The Bryant Heater Co., Cleveland, Ohio.*

Hexcel Humidifier

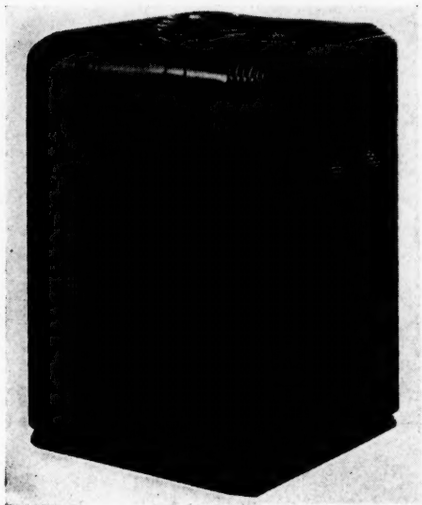
NAME—Hexcel Aristocrat humidifier.

PURPOSE—To increase humidity in room air.

FEATURES—The unit is of the vapor type in which the vapor is generated by a heating element. Water compartment holds 3½ gal. of water and it is said that the humidifier will emit 1 1/5 pt. per hr. An automatic switch shuts off the current when the water supply is exhausted. Unit resembles a table type radio and has an outer casing of two-tone walnut wood. Can be used with either a.c. or d.c. current.

SIZE AND PRICE—18¾ in. high x 14¾ in. wide x 12 in. deep; list price, $37.50.

MADE BY—*Hexcel Radiator Co., Racine, Wis.*



Cooling Equipment Sales Up Sharply with Self-Contained Units Leading

The point of view in presenting material in this section is the same as that which has been followed in previous years, namely that the summer functions consist of either cooling air or dehumidifying it, or both. A summer plant is thought of as one which is capable of cooling or dehumidification or both. Also as in previous summaries of what has taken place it is not possible to give full and adequate space to treat all phases of the subject. The result is that a considerable amount of picking and choosing has been necessary. However, it is believed that the points discussed here do bring out most of the interesting developments of summer cooling during the past twelve months.

During the whole year summer cooling continued to enjoy public acceptance, as a study of the statistics presented here will readily show. In the early months of the year this acceptance was reflected in increased sales volume of equipment which were record-breaking. The recession in business toward the end of the year was reflected but mildly in the sales of summer equipment. No especially notable shifts in the destination of such equipment took place, as about 95% of the dollar volume came from buildings where there was a profit motive in installing the cooling. Summer cooling as a non-profit proposition put in purely for the sake of promoting comfort for itself alone has thus far not made much progress.

Marketing and Distribution Methods

In the sale of summer air conditioning equipment generally, the year did not bring forth any notable changes in methods of marketing or distribution. The methods are still very diverse, with each manufacturer fitting the method to his products and his organization. Indeed, in many cases it is necessary for the same manufacturer to use a variety of methods equal to the variety of his products. The necessity of application engineering continues to be recognized in connection with the sale and installation of virtually all items of summer equipment. Those who had not recognized this necessity heretofore have generally swung into line.

Development of the self-contained summer cooling unit to the point where it is either wholly or nearly an electrical plug-in device may have some important bearing on marketing methods and practices. The year, however, did not see any important changes take place although it is significant that self-contained units did appear as an item of merchandise in department stores for the first time.

Another development during the year was the move of a number of important manufacturers of summer equipment into the winter field. By the end of the year there were only a small number of manufacturers left who confine their efforts wholly to summer equipment while offering nothing at all for accomplishing the winter phases.

Statistics

The statistical situation clarified somewhat during the year in that more and better figures are available. There are still many gaps in the information but it is now possible to draw a rather comprehensive picture of where summer cooling stands statistically.

For the first time three different statistical series are available for comparison of the year's summer cooling business with that of the previous year. Two of the series agree roughly while the third is out of line with the other two.

According to reports of 32 utility companies serving the great majority of the country's urban population, the number of air conditioning installations made during 1937 increased 40.9% over those of last year while from the same sources the whole power capacity of these installations increased 37.2%.

The Department of Commerce, which collects monthly statistics on the values of orders *booked* for air conditioning equipment, reports that on the basis of first ten months' figures, 1937 shows an increase of 74.9% over 1936 in the value of equipment ordered.

The Air Conditioning Manufacturers Association has made available a third series. Members of this Association report to the Association headquarters the value of orders *billed* each month. These are totaled and a factor applied in order to arrive at an estimated consumer's installed cost basis. These reports for the first ten months of the two years show an increase in 1937 over 1936 of 81.5%.

Each of these series has its own particular weakness and which of the three series is correct depends to some extent on just what sort of an estimate the user is concerned with. The utilities' reports have the disadvantage that although they cover the greater part of the country, they do not cover the entire country, and they do not include exports. Furthermore, they do not include systems installed in connection with privately operated electric plants. It is also quite possible that small-city utilities may have experienced a greater increase in load in percentage than the large companies.

The Department of Commerce series has the advantage that it is purported to cover 125 manufacturers and the disadvantage that the figures cover orders booked, some of which may later be cancelled. The ACMA figures, on the other hand, cover orders billed, a more accurate index, but the figures apply to only 10 manufacturers.

The complete tabulation of utility reports is shown in Table 3. This table shows not only the totals for the reported utilities for both 1936 and 1937 but also classifies totals in five major groups. Table 1 shows a comparison of these groups for the years 1937 and 1936 and strikingly brings out the decrease shown in number

TABLE 1—SUMMER AIR CONDITIONING BY BUILDING TYPE

Type	1937		1936	
	No.	Hp.	No.	Hp.
Commercial	65.9%	74.2%	65.5%	74.0%
Industrial	2.5	6.9	2.8	5.6
Theater and Recreat.	4.6	12.3	4.0	8.9
Public and Inst. ...	1.6	3.7	2.0	9.6
Residential	20.4	2.4	25.7	1.9
Total	100.0%	100.0%	100.0%	100.0%

and horsepower of public and institutional installations, the increase in theater and recreational installations, and the increase in number of residential installations, all on a per cent of total basis. The data summarized in Table 2, which shows the breakdown of summer air conditioning in New York City by size of job, are interesting in that they reflect a decrease in the number of small installations and a corresponding increase in the jobs over 20 hp. Data are not available to show whether this trend is a national one.

As shown in Table 3, important rises were shown in the following territories in 1937: Manhattan and the Bronx, Northern New Jersey, Philadelphia, Baltimore, Rochester, Pittsburgh (city), Cincinnati, Indianapolis, Chicago, St. Louis, Birmingham, Houston, Akron, Kansas City, North and South Carolina, Hammond, Ind., Hagerstown, Lawrence, Kan., and El Paso. Decreases of some importance are reported from Boston, Brooklyn, Washington, Toledo, and Hartford.

It is notable that during the year 15 schools in Philadelphia were reported to be air conditioned with a total capacity of 488 hp. In Philadelphia also three hospital operating rooms were conditioned as well as one hospital bedroom. In Indianapolis there was a sudden spurt in air cooling, a large part of which was in well-water cooled theater jobs. Indianapolis also reports a large hospital job of 38 tons. The figures from St. Louis are notable in that during the year 10 apartment houses were conditioned with a total of 205 hp. Philadelphia also reports one apartment house job of 5½ hp. St. Louis shows two hospital operating rooms of 14 hp. total, and four hospital patients' rooms of 4 1/3 hp. total. Rochester figures are of interest during 1937 particularly because of the fact that numerous installations there are additions to present plants. These additions during the year totaled 17 jobs of which the bulk of the capacity was added to industrial plant systems. In Atlanta three office buildings were reported to have been conditioned during the year, these jobs having a total of 650 tons of refrigeration. Washington reported a decrease of about 50% in capacity of installations during the year. This falling off greatly contributed to the decrease of the whole classification of public and institutional buildings throughout the country. The bulk of the capacity added in Cedar Rapids was in well-water systems. Chicago figures for previous years led to the thought that this city had few theaters not air conditioned, but it is interesting that for 1937 this city reports 33 theaters conditioned with a total capacity of 1846½ hp.

Outstanding in the report of Des Moines installations were two department stores totaling 765 tons and four hospital cooling jobs totaling 17¼ tons. Detroit reports 17 theaters during the year totalling 1043 hp., an office building totaling 807½ hp., and 58 industrial offices totaling 376½ hp. This city also reports seven hospitals with 94¼ hp. having been conditioned during the year and a prison with 1½ hp.

Reported but not included in Table 3 were 450 evaporative cooling installations in residences in El Paso. These totaled 122 hp. Of interest in Hagerstown, Md., was the conditioning of 10 offices totaling 74½ hp. Houston, Tex., reports 38 installations of which five were department stores and with a total of slightly over 1000 hp. capacity. Also conditioned in this city were 44 residences totaling 137½ hp.

Hartford reports several installations in a Psychiatric Institute in that city, four separate systems having been installed totaling 5¾ hp. Of these four systems one was in the office, one in the recreation room, one in the barber shop and beauty parlor, and the other in the diathermy room. Reported from Kansas City but not included in the figures in Table 3 were 292 hp. in evaporative cooling jobs installed during 1937. The utility in this city now reports 547 hp. on its lines in this type of system. This city also reported four hospital room jobs totaling 47 hp.

It is estimated that during 1937, 1997 railroad cars were air conditioned as compared with 2178 during 1936. The number of railroad cars in operation at the end of 1937 is estimated to be 10,075. Exactly how these are divided by type it is not possible to say, but figures are available for 8078 of these as follows:

Ice	3011
Mechanical	3982
Steam	995
Power Drive	70
Front End Drive	20

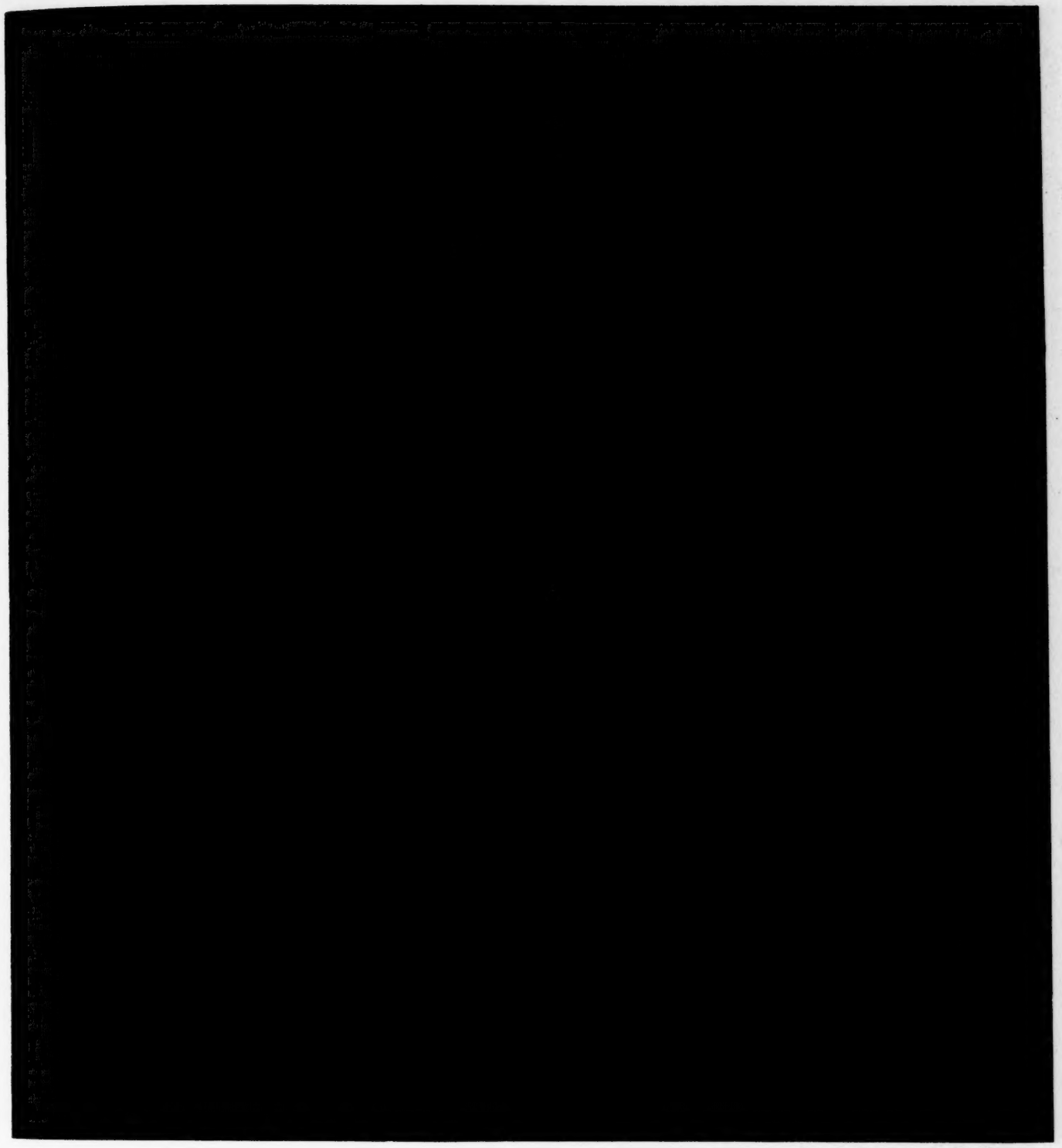
It is not possible to state exactly what proportion of these are railroad-owned and Pullman-owned, but as of October 1, 1937, when 9862 air conditioned cars were estimated to have been in existence, 5196 were railroad-owned and 4666 were Pullman-owned.

Increase in Self-Contained Units

Tables 25, 26, 27, and 28, presented here, show comparative 1936 and 1937 figures for some of the more important types of summer air conditioning equipment. Attention is especially directed to Table 25 showing self-contained units and where it will be noticed that the reported dollar volume for the first ten months of 1937 was nearly three times as great as for the same period of 1936, or an increase of nearly 200% for 1937 over 1936. This is by far the greatest increase of dollar volume of sales shown for any summer equipment type. This excellent record of sales of self-contained units is so outstanding that more extended consideration is

TABLE 2—SUMMER AIR CONDITIONING BY SIZE OF JOB, NEW YORK CITY, IN PER CENT OF TOTAL

Size, Hp.	1937		1936	
	No.	Hp.	No.	Hp.
Less than 10....	29.4%	3.4%	34.2%	7.3%
10 to 20.....	22.3	7.7	24.5	13.2
Over 20	48.3	88.9	41.3	79.5
Total	100.0%	100.0%	100.0%	100.0%



given to the situation and some of its implications later on in this issue.

Air Cooling in Hospitals

Since air cooling is known to have important effects on health, on the incidence, prevention, and treatment of certain diseases and on time and comfort of recuperation or convalescence from certain sicknesses, the progress made in putting air cooling into hospitals has been watched carefully for some time. Generally, hospitals have moved slowly. They do not have any excess of funds and feel obliged to weigh their purchases with care. Consequently, but few hospitals are equipped with air cooling in their general wards or in their private rooms. At the end of the year, however, a considerable number had special rooms so equipped and some had arranged for portable coolers which could be used in specific rooms as necessary. There was no indication during the year that hospitals generally are convinced of the necessity of installing air cooling equipment extensively.

Certain special hospitals, certain wards and departments of general hospitals, and experimental or trial installations are becoming common and found in hospitals well distributed over the country.

Interest in the possibilities of air cooling is keen on the part of doctors generally and appears to be definitely on the increase. Enough evidence has been ac-

MONTHLY EQUIPMENT SALES

SUMMER AIR CONDITIONING

25 Unit Conditioners Orders, Self-Con. Units

	1936	1937
Jan.	$36,263	$448,985
Feb.	76,582	201,771
March	123,861	1,154,521
April	102,788	739,433
May	509,024	835,541
June	479,685	1,271,474
July	321,844	495,691
August	93,502	144,976
Sep.	75,940	79,652
October	54,202	193,577
Nov.	106,728	—
Dec.	254,789	—
TOTAL	$2,235,208	—

26 Unit Conditioners Orders, Not Self-Con.

	1936	1937
Jan.	$215,420	$651,713
Feb.	192,763	826,374
March	639,665	1,399,247
April	541,155	961,899
May	878,797	832,975
June	763,884	1,046,960
July	678,146	1,217,633
August	552,492	572,274
Sep.	359,941	462,990
Oct.	523,992	415,281
Nov.	477,603	—
Dec.	750,591	—
TOTAL	$6,574,449	—

27 Central Systems Comfort

	1936	1937
Jan.	$307,941	$849,280
Feb.	569,122	1,176,708
March	717,498	2,385,955
April	428,844	1,234,131
May	646,494	1,104,603
June	536,745	1,113,794
July	408,283	781,112
August	286,170	315,836
Sep.	341,696	301,602
Oct.	235,328	310,687
Nov.	177,194	—
Dec.	292,494	—
TOTAL	$4,947,809	—

28 Central Systems Industrial

	1936	1937
Jan.	$78,706	$73,412
Feb.	35,477	29,708
March	95,970	145,633
April	93,632	94,742
May	25,091	136,742
June	23,430	99,974
July	49,040	23,590
August	141,022	45,302
Sep.	34,177	43,184
Oct.	199,360	110,487
Nov.	88,419	—
Dec.	416,564	—
TOTAL	$1,280,888	—

cumulated to indicate that nurseries for premature infants can well be provided with equipment capable of year-round operation and maintaining 77F and 65% R.H. How many such nurseries are now so equipped or how many were installed during 1937 is not known but the number is not great. It is reported on good authority that at the year's end over 100 operating rooms in hospitals are equipped with air cooling equipment. Here again the equipment is usually for year-round operation with the intent of maintaining a relative humidity of 55 to 60%, a temperature of 80F in warm weather and 72 to 75F in cold weather. The air problem in operating rooms is a pressing one and considerable extension of air conditioning to these rooms is to be expected. Special rooms where oxygen therapy is practiced also appear to require air cooling for best results. A considerable number of hospitals are equipped with such chambers.

While there are two other special adaptations of air and temperature control which received much attention in hospitals during the year, they are not particularly important in the cooling phase. One of these is fever therapy and the other is treatment of allergic disorders, one of which uses an air heating technique while the other is more concerned with air filtration than with cooling. These are mentioned elsewhere in this issue.

The situation at the year's end can be summarized by stating that hospitals generally are receptive, that much studying and experimentation is going forward, that operating rooms are looked on as the first logical place to put cooling and that many such rooms were so equipped during the year, that there is little indication that air cooling will be generally practiced on a hospital-wide basis for some time to come. A description of the equipment installed in a modern hospital may be found in HEATING & VENTILATING for February, 1937, page 27.

The Year's Oddity

With summer cooling still relatively new, there is still ample room for innovations in applying it. Each recent year has seen some unusual adaptation suggested or tried out. Perhaps the most interesting one during 1937 was the suggestion from England, that a knock-down cubicle be designed which could be readily transported to the tropics, erected quickly inside existing buildings there and used to permit its occupants to defeat the bad summer weather. Such a cubicle was thought to be marketable at $500 to $700 each. It would really be an enlarged edition of the processing cabinets or cubicles used to some extent in the United States.

Technical Information

Contrary to what was true only a few years ago, so much technical information appeared during 1937 that no attempt is made to summarize it here. It is believed that the monthly "Abstracts" pages in HEATING & VENTILATING constitute as good and complete a running record of this published information as is possible. In addition, naturally much of this kind of material is circulated privately. It is not proposed here to do more than mention a few items. The Chicago contractors prepared a pamphlet entitled "Certified Refrigeration" which appeared early in the year, and continued their program of furnishing technical applicational material to their members. Books, booklets, pamphlets and brochures carrying technical data of various kinds, and on many phases of summer air conditioning came out in greater number and variety than during any recent year. Whatever shortage in such material may have existed is now largely remedied. So strong was this movement that it may be said to have constituted one of the major trends of the year.

Education and Training

During the year, too, there was unprecedented activity in training application and field engineers, technicians, and service mechanics. It has been generally stated for some time that the anticipated development of summer cooling in the next few years will call for the services of many trained men of these abilities as well as hordes of salesmen and sales engineers. This year saw much of this thinking turned into action. Colleges and universities offered new or revitalized courses and called conferences largely for training designers and technical engineers, but to some extent for giving attention to sales and service aspects as well. Manufacturers have prepared and offered courses

galore, some for sales, some for application, some for both. Trade schools, mechanics institutes—both day and evening—and public vocational training schools have courses for all interested, frequently for service mechanics. Correspondence courses are offered covering much the same ground as those which require personal attendance at schools. During the year, the training of men to enter the air conditioning business showed signs of rivaling, in volume and interest, the manufacturing and distribution aspects of the industry itself.

Cooling in Transportation Vehicles

Cooling of steam and diesel railroad cars in this country continued throughout the year. As a result of a testing program inaugurated by the Association of American Railroads and largely carried out in 1936, reports appeared during the early months of 1937 summarizing the results (see HEATING & VENTILATING, March, 1937, page 67). The testing program was broad and the reports constitute by far the most comprehensive collection of performance data on air conditioning equipment which has appeared to date. Further steps by the railroads are expected to be greatly affected by these findings.

Railroads in other parts of the world were also active in providing passenger car cooling. This was especially true in India, in Indo-China, in Australia, and in other parts of the British Empire. Details of their installations so far as known indicate no notable disagreement with the methods used here but much of the equipment is of Empire manufacture.

Cooling of private passenger automobiles continued to be a dormant issue. Methods and equipment are not lacking, but public demand is anything but insistent at present. The interest in air conditioning has naturally prompted the automobile manufacturers to pay increasing attention to their heating methods and one prominent maker has an air filtering device built into his 1937 models. One trailer manufacturer showed his trailer equipped with a self-contained unit air conditioner of 1/3-ton capacity as optional equipment at extra cost, but it is believed that this arrangement resulted in no phenomenal sales.

Motor coaches continue to be eyed as a promising field of application. There are a number of methods worked out. Bus operators, however, still have to be convinced. One manufacturer equipped a special bus for field demonstration purposes (see HEATING & VENTILATING, May, 1937, page 39).

Although several installations of cooling equipment in coaches for desert runs were reported from abroad, 1937 closed with but little activity in bus cooling applications.

Airplanes and short-run suburban railroad cars continued to use limited cooling. Portable coolers which can be wheeled alongside the vehicle when stationary continued to be the accepted method. Evidence points toward this method remaining in favor with these vehicles for some time.

One manufacturer of custom-built ambulances is reported to have introduced ice comfort cooling into his vehicles. He has an ice bunker under the floor with sufficient capacity to maintain comfort for up to five hours on a hot day with a single filling of the bunker. His plan is said to not only maintain a comfortable temperature but the windows can be closed and the occupant saved the annoyance of dust and street noise.

Apartment House Progress

The better class of apartment house has been considered a logical place to put summer cooling equipment, but no great progress has been reported up to 1937 in actually getting such installations made. Here and there a few houses tried it out. In October, from St. Louis, however, came the announcement that in that city 10 new apartment houses contracted for complete year-round conditioning and that several of these were then completed and ready for occupancy. This is the first case of record where any sizable number of apartment houses in the same city have gone in for summer air conditioning. It is of interest to note that in these buildings the present trend seems toward treating each apartment as a separate unit so far as air circulation is concerned, but that heating and cooling are provided from some central location. At the year's end the apartment house as a prospect for summer cooling remained much as before, but the year did bring evidence that some impression is being made in the form of actual sales.

Residence Cooling

Opinion regarding the ultimate success of getting a huge amount of summer cooling into detached residences did not appear to undergo any notable change during the year. The general consensus throughout the industry continues to be that ways and means will be found to make full summer cooling so appealing that it will be widely accepted. Available statistics for 1937 do not show anything exceptional along this line—steady growth but still only a minor destination for cooling equipment. The combination of insulation, awnings, and a substantial attic fan appears to be making much more rapid progress toward consumer acceptance than does cooling by any other means. This is especially the case in the Southwest and in the hotter cities where there is more reason to give attention to residence cooling than elsewhere in the country. Many engineers continue to be skeptical regarding the necessity of providing more than a minimum of artificial cooling in detached residences although many do advocate making adequate provision for its ready addition in new construction. Few people can be found who will risk a firm estimate as to when the residence cooling potential will be realized. During the year, test data appeared (HEATING & VENTILATING, May, 1937, page 52) showing that the ordinary small capacity fan attached to a forced warm air heating system does not produce much cooling effect. These data only confirmed what is predictable without test, but still many detached residences continue to be provided with no other positive means of cooling.

Codes and Standardization

Codification of rules of practice for summer air conditioning went along rapidly during the year. Following the setting up of testing and rating procedures by the ACMA in 1935 and 1936, the most pressing need for codification and standardization continued to be the

matter of computing cooling loads and estimating the required capacity of equipment to handle such loads. There has been and still continues to be much variation in individual practice in this connection.

During the year there was evidence that the applicational rules published by ACMA in 1936 were being widely used, and that as a result there was much less confusion over estimates for application than had prevailed. During the year, too, a joint committee of the two engineering societies, ASRE and ASHVE, under the chairmanship of L. A. Harding, produced a report labelled Code of Minimum Requirements for Comfort Air Conditioning. This code covered much the same ground as that covered by the ACMA application code. At the year's end it had not been adopted, but a vote on its disposition was expected at an early date.

In addition to this applicational code of national scope, several local groups produced codes of similar nature. Late in March a committee under the chairmanship of E. Szekeley recommended a code for use in the state of Wisconsin, which is essentially an applicational code, and which ties in with the state code for winter air conditioning (see HEATING & VENTILATING, June, 1937, page 43). Like groups in several other localities are in existence with the idea of preparing such codes although none completed its work during the year.

The Municipal Reference Library in Chicago published the Chicago ordinances applying to heating, ventilating, and refrigeration, including all amendments up to early 1937, intending this action to serve the interests of trade and technical groups (HEATING & VENTILATING, July, 1937, page 73). In Fort Wayne and Minneapolis extensive ordinances were drawn up and passed governing local practices. Moves were made in Washington to formulate a city code of like nature. Local legislative interest in air conditioning is keen in many localities and action can be looked for in many cities. So far this interest has been largely confined to rules of practice intended or alleged to protect the public, but there is no foretelling how soon some of this interest will take the form of taxation. Bills to tax fuel oil sales appeared during the year but there is no record yet of their having been enacted.

In New York a safety code governing the use of refrigerants was prepared and discussed in 1936. During the present year, this project has made no progress due to moves having been made looking toward the formulation of a code which can be used nationally, and which it is hoped can be subscribed to by New York authorities. Appearance of the draft of such a code was reported imminent at the year's end.

For some time a building code has been under consideration in New York City and during the year this code was passed. Minor amendments are anticipated. The code carries several features not found elsewhere. (For the chief points see HEATING & VENTILATING'S Reference Data Sheet 64.)

In spite of the large amount of codification now in existence, there is every reason to believe that this kind of activity is likely to continue for some time. So far the codification has been undertaken largely on private initiative; is fragmentary, dealing with only some few specific points; is local, and all too frequently is done with an eye to competitive advantage. With each such piece of work which appears, just that much more ammunition is being furnished to those who are likely before long to start in to consolidate and combine these codifications of rules and practices. After that takes place enactment into public laws and ordinances soon follows, and the situation all too frequently becomes completely frozen.

Condenser Water Problems

With water cooling of refrigeration condensers, the amount of water which must be passed over the condenser is necessarily large. If this water is drawn from private wells, public wells, or any other source and used but once, a large supply of water at low temperature must be available. This fact is well known and for a long period engineers have been aware that sooner or later its implications must be faced in full. Generally, the industry knew the alternative in the form of re-use of the water with atmospheric cooling, had equipment ready and in use to meet the problem. Cooling towers and evaporative condensers are not new to anyone regularly engaged in summer cooling applications.

During the year, however, engineers and the officials connected with the furnishing of public water supply gave much attention to the subject. Papers were presented at their meetings. Reports and surveys appeared in attempts to arrive at the facts. One of these (see HEATING & VENTILATING, September, 1937, page 77) published by a bureau of the U. S. Commerce Department, reported that in 38 cities steps had already been taken or were being considered to limit the water-using air conditioning equipment in its demands on public supply. In a number of cities, also, disposal of this water to public sewers was reported as a problem. Perhaps the most permanent item of value in this particular report was a listing showing the water supply temperatures to be expected in the summer months in a large number of cities. A publication of the Geological Survey also appeared carrying information about the temperatures of ground and surface water available for condensing purposes in various cities.

There continues to be considerable difference of opinion as to how the condenser water problem is to be solved. Some assume that public supplies will shortly be largely increased in order to permit use of as much water as desired for condenser cooling purposes. Even if this view is correct, which is doubtful, to say the least, provision of these supplies is likely to be slow.

Moreover, there is every reason to believe that water furnished for this purpose would have to bear the burden of the full demand charges against the capital which would have to be invested to furnish the supply. In view of these considerations it can be stated that nothing took place during the year which would indicate any particular change from the already established trend toward re-use of the condenser cooling water in evaporative condensers and cooling towers. If anything, the facts brought out during the year tended to confirm the necessity of these practices and to point toward their further acceptance.

Well Water for Air Cooling

The water problem is of interest not only for condenser purposes, but also as a means of cooling air, with or without mechanical refrigeration. It has long been used for this purpose in those localities where a sufficient supply is available at a suitably low temperature. Instances are the Minneapolis area and the district around southern New York where various manufacturing establishments use much well water for cooling purposes.

Last year a pamphlet put out by an organized group set forth methods for applying well water to summer air conditioning in small buildings. No record is at hand to judge statistically the present position of this form of cooling. During the year, however, results of a study made at the University of Illinois, where the research residence was cooled by water, were announced and a speaker before the warm air heating industry group urged the importance of well water cooling for residences (see HEATING & VENTILATING, March, 1937, page 60). Several installations using well water for cooling purposes were described during the year (see HEATING & VENTILATING, March, 1937, page 55, and June, 1937, page 46). These all indicated that successful installations using this method of cooling with private wells could be obtained with water at from 55 to perhaps 60F. Just where the upper limit of the temperature of the water supply lies is not yet fully clear when dehumidification and cooling are both desired using the well water as the agent. Available information on city water supply temperatures indicates that in only a few cities is this source of supply cool enough to permit its successful use for dehumidification.

Just how extensively well water can be used for cooling is still not settled. Estimates as to reserves of this cold water, and information as to the effect of withdrawing large quantities of low level water are both scarce. So also is there but little widely held information as to local costs of well drilling, likely flows to be obtained, and the likelihood of obtaining a reliable well. Once water is available, it can be readily applied to air cooling and dehumidification, using existing means and information. Until there is better information at hand on many of the correlated items, progress in the application of well water from private wells to comfort air conditioning is likely to continue to feel its way along as happened during 1937.

Absorption Drying of Air

Solid absorbent equipment using calcium chloride as the agent in drying for air conditioning has been on the market for several years and no record is at hand of any new manufacturers having brought out equipment using this means during 1937. Neither are there any statistics showing how many installations are now operating. The liquid absorbent, lithium chloride, continued to draw attention. Its chief applications are still in industrial plants.

Absorption Cycle Refrigeration in Air Conditioning

During 1936 one oil burner manufacturer announced equipment for applying the absorption refrigeration cycle to air conditioning and making use of oil or gas as the primary energy source. During 1937 several installations using this equipment were reported in existence but the exact number is not available. Absorption equipment using gas as the fuel has been in existence for some time but not in sizes suitable for air conditioning. Attention continues to be directed to this cycle, however, with a considerable amount of development work being quietly done, but without notable announcements during the year. The whole quest here hinges about finding primary energy for air conditioning other than electric sources.

Adsorptive Dehumidification

While city water or water from surface sources and having a warm weather temperature of 60 to 70F probably cannot be used in installations where it is expected to accomplish adequate comfort dehumidification, still this kind of water can be useful for summer air conditioning. It can precool air where refrigeration is used to accomplish dehumidification and it can be used in connection with adsorptive dehumidification as an aftercooler.

In this connection it is of interest to note the statistical progress reported in the application of adsorptive dehumidification by such means as silica gel and activated alumina. This process made but slow progress for a considerable period due to a variety of reasons among which was the necessity of developing suitable equipment at prices attractive to the purchaser. Prominent manufacturers reported that during 1937 they had at last begun to find quantity sales, with the result that the number of installations during 1937 was substantially double that of 1936. By the end of the year approximately 200 installations were a matter of reasonably definite record with the likelihood that there were some not included in the returns. Of those known, about half were in industry, especially those where processing of product requires dry air. Most of the remainder were in commercial applications with but few in residences. It is difficult to get a correct picture of what these installations represent in terms of "tons of refrigeration" of equivalent cooling because many of them do not involve any lowering of dry bulb temperature. Substantial amounts of fuel, usually gas, are used with these 200 installations, however.

Not only did equipment sales increase notably during the year, but there were several other developments in connection with this subject. For one thing, it is believed that engineering thinking in connection with adsorptive air drying and air conditioning began to clarify. This is an intangible, but nevertheless impor-

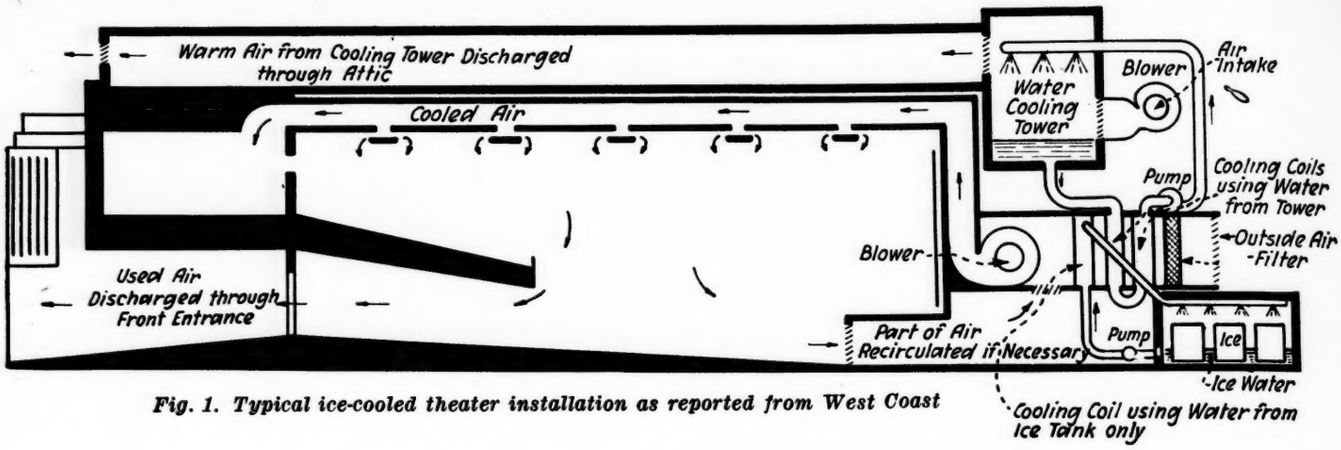


Fig. 1. Typical ice-cooled theater installation as reported from West Coast

tant, point. The fact that cooling to the dewpoint is not necessary in order to dehumidify is slowly being realized; also that air cooling and dehumidification are separate and distinct processes is slowly but surely penetrating. Another important point is that during the year at least one leading manufacturer of refrigerated equipment is reported to have moved into a position to capitalize on the growing acceptance of adsorptive drying of air.

Air Cooling with Ice

Application of ice to summer air conditioning continued to expand. Since the activity was without benefit of coordinated national promotion this development was confined for the most part to sections where local promotion was placed behind it. These sections include the North Atlantic area, California, the Great Lakes region and a number of the smaller cities more or less evenly distributed throughout the country.

Along the Atlantic Seaboard from Washington to Boston, a number of ice air conditioning installations were reported, principally in theaters, restaurants, and night clubs. The systems were of more or less standard type with the cold water for spray or surface type cooling equipment furnished by an insulated bunker, and operating under automatic control.

The picture was different in California, especially in the sections where long summer seasons are encountered. Combined systems using water cooled by evaporation, and city and well water, were installed in connection with smaller sized ice bunkers. Such a system operates on the water supply alone for the early part of the season when it is adequate to do the required work. Later on the water from the cooling tower, city supply, or well is employed only for primary cooling of the air while secondary cooling and dehumidification are accomplished in a separate set of coils through which ice water is circulated. A sectional drawing of such a system is shown in Fig. 1. In this particular instance the discharged air from the forced draft cooling tower passes out through the attic space, and in this way reduces the roof load.

A typical installation of this two-stage type was made in the Exeter Theater, Exeter, Calif., in the San Joaquin Valley. The theater already had an air washer installed, and it was converted to serve as a forced draft cooling tower with the discharged air passing out through the attic space. The water cooled by evaporation in this converted air washer is circulated through a primary coil in the theater air conditioning system. A small ice water cooling tank was installed and the water in this circuit is cooled by spraying over the ice, and is then passed through the secondary or final stage cooling coil.

In this system much of the reduction in dry bulb temperature of the air is accomplished by the cooling tower water which is circulated through the primary coil counter flow to the air. The system has two pumps and two blowers, but the total connected horsepower is moderate, and the system is reported to be economical in the consumption of ice. While the cooling system is arranged in two stages, the actual equipment employed is simple and low in first cost.

The two-stage system has brought summer cooling within the economic range of many users, because the total equipment cost is frequently reduced to about one-half the cost of other systems of equal size and performance. The operating costs, as well as the fixed charges, are at a minimum. An interesting installation of the two-stage type employing well water in conjunction with ice water was installed in the Visalia Municipal Hospital, Visalia, Calif. Installations were also made in office buildings, banks, and restaurants, as well as in additional theaters.

Portable ice room coolers were installed in many types of service during the year. For instance, a Chicago hotel kept some fifty of these coolers in service during the past summer. These are furnished to guests on a daily basis at a slight additional cost over regular room rental.

Driving Compressors with Gas Engines

An interesting tack in connection with the attempts to displace electric energy as the air conditioning power was made possible by the availability of a fully automatic gas engine. This engine is available in horsepower ratings of 7, 21, 42, and 84. The manufacturer recommends that these engines be applied to driving air conditioning compressors so as to operate at about 60% of these ratings or with compressors rated at approximately 4½, 12, 25, and 50 tons. One of the principal operating characteristics of this engine is that the controls are so arranged that the engine speed changes with the load on the compressor, thus giving a modulated speed with steady engine operation instead of start-and-stop operation as is so frequently used when electric motors drive refrigerating compressors. These

engines have been used on a large number of air conditioned railroad cars, and in a wide variety of buildings, especially in the Southwest where natural gas is generally available. It is too early to attempt to appraise the effects of this development on air cooling generally, but it is possible that they will be the means of a distinctive procedure in the natural gas areas especially. By the middle of 1937 it was reported that there were 75 of these engines in operation commercially and that many of them had been installed during 1937.

Steam Jet Refrigeration

Equipment for using a steam jet to produce a vacuum for cooling water has reached such a state of development that the year's record of new equipment does not show any announcements. However, this form of refrigeration continues to be installed, and operators reported results of studies to secure improved operating economy (see HEATING & VENTILATING, July, 1937, page 62, and December, 1937, page 44). Operators of steam jet equipment are known to be observing its performance with care in a number of installations, and announcements of their findings are expected soon. Information at hand indicates that less tonnage of this equipment found its way into use during 1937 than during other recent years.

Electrically-Driven Compression Refrigeration

In spite of all attempts to displace electricity as the energy source for cooling air, electric motors continued to dominate the situation with probably not less than 90% of the energy supplied from electrical power. Statistics are not reliable on the subject, but there is some basis for the belief that during 1937 electricity improved its relative position. For the present at least, any serious change in this situation is scarcely to be expected. So long as this continues, it is natural to expect also that the compression cycle of refrigeration will remain in vogue since the electric motor readily furnishes power to all types of reciprocating, rotary, and centrifugal compressors.

Equipment for air cooling, and especially the compressors for this purpose, continues to be improved in design and performance. They are more and more simplified and adapted to quantity manufacture with each passing year. Among the especially notable events of the year was the appearance of a reciprocating piston compressor with cylinders built radially around a central shaft, and direct driven at 1750 r.p.m. by an electric motor, whereas the conventional design places the cylinders in line or with the V arrangement used in automotive engines.

Self-Contained Cabinet Room Coolers

Mention has already been made earlier in this section of the improved statistical position of the self-contained cooling cabinet. Its increase in dollar sales volume over 1936 was easily the most outstanding of any of the equipment items usually associated with summer air cooling and conditioning. Because of this it is naturally interesting to examine this equipment more closely. It should be clear that there are self-contained units of many kinds. For example, they are built for ceiling mounting, for floor mounting, and for both comfort and industrial purposes. The statistical reports lump them all together as one group, and consequently do not give any clue as to which particular types account for the greatest increase in sales volume. Knowledge of the general events in the industry during 1937, however, prompts the conclusion that most of the increase was accounted for by the increased popularity of the comfort, floor type, self-contained variety, enclosed in a well-finished cabinet. It is the form which has received most attention on the part of many manufacturers, and on which much design and development talent has been concentrated.

Reasons why this is so are easy to find. In the eyes of many people a compact, well-finished, quiet, efficient unit which contains its own source of cooling and which can be installed readily in existing buildings is the one way quickly to achieve mass production and mass distribution of comfort room coolers. Such a unit, it was early perceived, would be equally well applicable to offices, stores, restaurants, and to living quarters. Moreover it could be put into either new or existing buildings. Besides it could be developed to a point where the installation would be simple—perhaps to a plug-in, electric appliance, making the manufacturer and seller entirely independent of the installation problem, and permitting the purchaser to move his unit at will. The idea was so appealing that the mass producers especially—and others in the industry generally—started in to try their hand at it.

By early 1932, the first of these products began to appear on the market. In the October, 1932, issue of HEATING & VENTILATING wherein typical air conditioning equipment as of that date was reviewed, two self-contained room cabinet coolers were listed. One of these was for connection at windows, while the other one was for location anywhere in the room, but the refrigeration equipment was in a separate cabinet which could be located alongside, if desired. By July, 1933, several other makers had brought out self-contained cabinets, for five such cabinets were illustrated in the July, 1933, issue of the magazine. There were few announcements during 1934 and 1935, but during 1936 eight additional manufacturers brought out new cabinet units of this kind, while during 1937 still more added these products to their lines. At present it is possible to list at least twenty manufacturers of self-contained cabinet type room coolers for floor mounting. There is reason to believe that others will continue to be attracted now that the field looks promising.

Even the earliest products presented an attractive appearance and were

reasonably compact with a ½-ton capacity unit enclosed in a metal cabinet about 3½ ft. long, 3 ft. high, 18 in. deep, and weighing approximately 500 lb., including cabinet.

Put on the market, reports soon began to show up the weaknesses. The first complaint was high price. Then there was the necessity of making field connections to water supply and to drain, for the condensers were water-cooled, and cutting and fitting were frequently necessary to an extent which caused the purchaser to rebel. Power demand had to be limited to the carrying capacity of existing lighting circuits, and sometimes to the capacity of local electric distribution facilities. There were operating troubles; units leaked, were noisy; did not give good cooling effects because the air distribution was faulty. Naturally, effort has been directed toward improvements to cure the faults.

Leaks have been stopped by improved mechanical construction and did not present any great problem. Noise has been greatly decreased by close study of its source, and its reduction there to some extent. Newer models are carefully mounted and cradled to eliminate excessive vibration being carried to the floor and structure. The cabinets are generally lined with sound absorption materials. Air moving equipment and grille openings are proportioned with an eye to sound elimination. Improved designs of compressors and compressor valves have helped. The 1937 models were notably quieter than the early ones. Air distribution was improved with better grilles for controlling air direction at delivery.

Automatic controls are frequently found in the delivered product now, while the early models depended on hand control. But little has been accomplished in the matter of weight reduction or space requirements with these units although one 1937 model of 2/3-ton capacity occupied only slightly greater space and weighed only slightly more than a ½-ton capacity model put out by the same maker three or four years earlier. Outward appearance has not changed greatly.

No cure for the power circuit limitation has been found. Consequently, the upper limit of capacity of most present lines of models is 1 ton of refrigeration, corresponding to about a 1-hp. motor. A few models are available in larger capacities. Seldom is the capacity stated as less than 1/3 ton of refrigeration although there are units made rated at 3/10 ton. The general range of sizes is 1/3, 1/2, 2/3, and 3/4 ton of refrigeration effect, but all manufacturers do not make a full line, several offering only a single capacity unit. Some advances have been made along the line of equipping the unit with more than one motor in order to keep down the heavy demand for electric power at starting.

Interesting have been the developments aimed at securing freedom from connecting the units to anything but electric power lines—making real plug-in devices of them. Obviously, the units must be entirely free of any water connections at all if they are to be strictly plug-in. This means condensing the refrigerant without water and disposing of the moisture condensed out of the room air without taking it to a drain.

The refrigerant could evidently be condensed by resorting to air cooling instead of water cooling, but this necessitates a connection with air outside the cooled space, generally a larger and more expensive condenser, a fan to handle the condensing air, and also frequently a filter to keep this air from fouling the condenser surfaces, as well as the operating changes in the cycle brought about by the temperature of the cooling air available. One immediate effect also was to modify the unit so it could be placed in front of a window opening and connected to the outside air without much cutting or fitting.

The water condensed out of the room air could be collected and carried over into the condenser air,—there be re-evaporated and carried away to the outside by the condenser air current. This method was early adopted in these units.

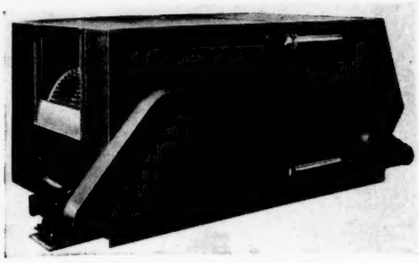
During 1937 the idea of evaporative cooling of the condensers was applied by several manufacturers although this general method was used in at least one earlier model. Here the idea is to wet the condenser coil surface with the moisture taken from the room air to which is added enough water from an outside source to make up any deficiency in the amount necessary to wet the surface. In the strictly plug-in unit this added water must be supplied by hand at suitable intervals. Another way is to connect a small water supply pipe, but this departs from the plug-in and requires pipe fitting. Now, early in 1938, the air-cooled, window-located, self-contained room cabinet cooling unit is on a plug-in basis. Many makers of this kind of unit also offer water-cooled products requiring pipe-fitting as well as the air-cooled variety needing little or no installation labor except the electric plug-in.

Limited inquiries indicate that generally for equal cooling capacity the installed price charged the consumer is about 15% higher for the air-cooled models than for the water-cooled. In 1-ton capacity the consumer price installed is in the neighborhood of $500. For a 2/3-ton capacity air-cooled unit one manufacturer quotes a consumer price of $400. The lowest known consumer price for a 1-ton air-cooled unit is just under $450. These prices are typical only and not exact, since they vary from place to place. The price per ton decreases considerably as the capacity of the unit increases. Over 3-ton capacity the price begins to approach $300 per ton.

During the year a 1/3-ton air-cooled plug-in type unit was offered on the market through a department store at $199.50 installed. So far as known this is the lowest priced unit. It also represents the first known instance of a department store offering self-contained room coolers to the public.

From all this, it is apparent that this kind of equipment has come quite a distance along the road of development during the five years since it made its initial appearance. Moreover, 1937 saw this development receive considerable impetus. Just where it will go from here is debatable. That it has a bright future few will deny. Certainly there is no reason to believe that the last word has been said or that the development will stop at this point. It will be well worth watching, for if consumers are willing to pay $10,000,000 to $12,000,000 per year for these units now, there is every reason to believe that we are on the verge of another of those spectacular sales increases such as marked the progress of the oil burner and stoker.

1937 Summer PROGRESS Equipment



Kelvinator Evaporative Condenser

NAME—Kelvinator evaporative condenser.

PURPOSE—For condensing refrigerant gases by evaporating water.

FEATURES—Unit type construction and is said to be easily installed in any convenient location. Cabinet is made of steel with removable panels to make the interior accessible for cleaning. Brass discs revolving in a bath of water distribute a finely divided shower over the condenser coil. A small motor is used to rotate the discs. The condenser coil is of the fin type with wide fin spacing to facilitate cleaning. Eliminator plates are provided for the removal of the entrained moisture from the discharged air stream. A centrifugal-type fan is used for drawing the air over the condenser coil and discharging it to the outdoors. This condenser is designed especially for use with Kelvinator condensing units. It can be located adjacent to the condensing unit or remotely depending upon space limitations.

SIZES AVAILABLE—Five evaporative condenser sizes to match corresponding Kelvinator condensing units; capacities range from 5 to 20 tons refrigeration.

MADE BY—*Nash-Kelvinator Corp., Kelvinator Div., Detroit.*

Henry Dehydrator

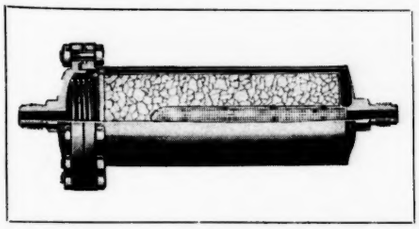
NAME AND MODEL NUMBER — Henry cartridge dehydrator, type 744.

PURPOSE—For removing moisture from refrigerants.

FEATURES—The dehydrator is easily refilled by inserting the dehydrant cartridge. A dispersion tube for increasing the drying efficiency is incorporated as a part of the refill cartridge. To provide a positive and tight sealing action of the dispersion tube on the inlet fitting and to prevent the bypassing of the refrigerant between the outside of the cartridge and the inner surface of the dehydrator shell a strong spring is provided.

SIZES—Available in three fitting sizes with three dehydrant capacities. The fitting sizes are ¼, ⅜, and ½ with dehydrant capacities of 11.5, 27, and 41.5 cu. in.

MADE BY — *Henry Valve Co.*, 1001-19 *N. Spaulding Ave., Chicago.*



Fairbanks-Morse Well Pump

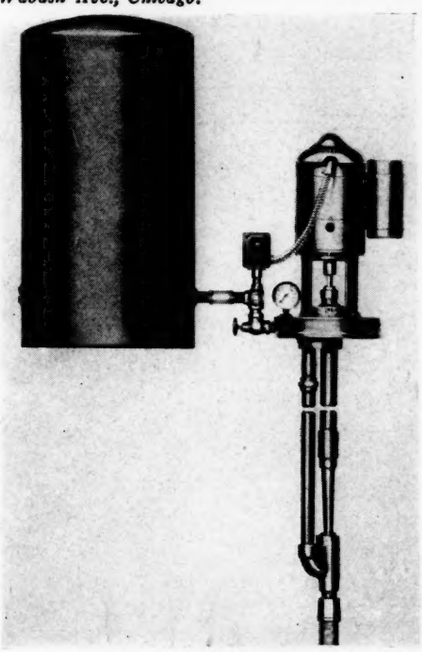
NAME—Fairbanks-Morse centrifugal pump.

PURPOSE—For general service in deep or shallow wells.

FEATURES—This pump was designed to meet the need for a small diameter, low capacity pump with low initial and operating costs. It is said to be fitted for pumping water under either high or low pressures at 6 to 60 g.p.m. Units for shallow well service consist of a combined motor, pump and base, into the bottom of which is screwed a single suction pipe extending below the water line. This is satisfactory for water lifts of 15 to 20 ft. Pumps for deep wells, 20 to 200 ft., are equipped with an ejector and venturi in one of two drop pipes extending from the pump down into the well. By allowing a predetermined amount of water from the pump discharge to bypass down one of the pipes in the well and back up through the ejector into the venturi, a vacuum is created above the ejector nozzle, drawing well water into the suction chamber. The high velocity of water through the venturi and the mixing of the two streams of water lift the well water to within reach of the pump suction. The illustration shows the ejector centrifugal pump with pressure tank and automatic controls for deep well service.

LITERATURE AVAILABLE—Bulletin 6640.

MADE BY—*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago.*



Goodrich Sheet Packing

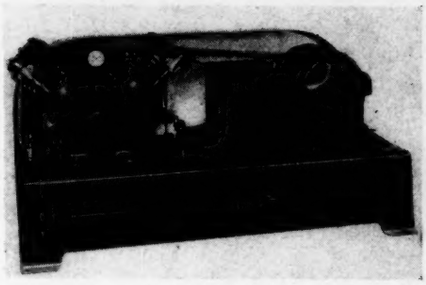
NAME—Prenite 20M asbestos sheet packing.

PURPOSE — A sheet packing for use with equipment handling oil or refrigerants such as Freon, methyl chloride and sulphur dioxide.

FEATURES — The manufacturer states that this new packing offers increased resistance to oil and refrigerants. Absence of sulphur in its composition is said to make a packing that will not corrode metal parts.

SIZES—50 x 50 in. sheets in 1/32, 1/64, and 1/16 in. thicknesses.

MADE BY—*Mechanical Rubber Goods Div., The B. F. Goodrich Co., Akron, Ohio.*



Carbondale Refrigerating Units

NAME — Self-contained low-pressures refrigerating units.

PURPOSE — Refrigerating units designed to employ either freon or methyl chloride for either air conditioning or general refrigerating purposes.

FEATURES—The compressor unit is compact, is mounted on a sturdy welded steel base and requires small floor space as well as low head room. Both suction and discharge valves are of the light-weight type. The V-type compressors, from 4 to 8 cylinders, are made of special metal which is said to combine extra strength and great density. A self-adjusting motor bedplate is provided to maintain proper belt tension at all times. The 8-cylinder unit has adjusting screws for the motor baseplate. Receiver is integral with a shell-type condenser which is fitted with copper-finned condenser tubing of welded construction throughout.

LITERATURE AVAILABLE—Bulletin No. 1121.

MADE BY—*Carbondale Div., Worthington Pump and Machinery Corp., Harrison, N. J.*

Patterson Water Cooler

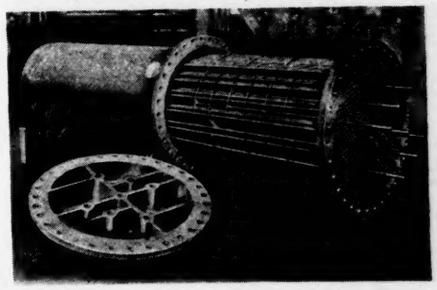
NAME—Patterson Freon water cooler.

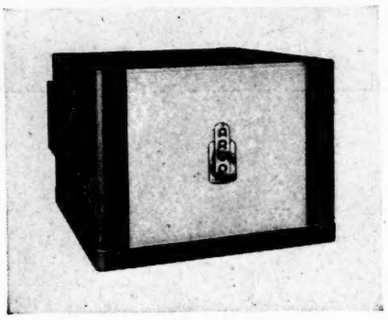
PURPOSE—To cool water in closed or open circuits by the use of Freon or similar refrigerants.

FEATURES—Cooling is accomplished by expanding the refrigerant within the tubes and circulating water around them. Tubular cooling surface is in multi-pass arrangement, insuring a long travel of the refrigerant. Water is caused to flow back and forth across the tubes by means of a series of transverse baffles which is said to provide a turbulent flow throughout the entire travel. Coolers are built with welded steel shells, rolled steel tube sheets, semi-steel expansion chambers, and copper tubes and baffiles. Tubes are U-shaped and expanded into the tube sheet. The entire tube bundle is said to be easily removable for inspection and cleaning.

SIZES AND CAPACITIES—Made in 17 sizes ranging from 5 to 100 tons of refrigeration.

MADE BY—*The Patterson-Kelley Co., Inc., East Stroudsburg, Pa.*





Arco Cooling Equipment

NAME — Cooling attachment for Arco air conditioners models 101-B and 201-B.

PURPOSE—An auxiliary device designed for installation on the discharge side of Arco air conditioners for use in connection with cold water cooling.

FEATURES—Tentative data indicate that it is possible to produce 1.6 to 2.1 tons of cooling with the first unit and 3.1 to 4 tons of cooling with the second when a cold water temperature of 50F is available. With the above performance the water rate on the smaller unit is from 3 to 6 g.p.m. and on the larger unit from 6 to 12 g.p.m. Performance data are based on the performance of 75% recirculated air at 80F dry bulb and 67F wet bulb and 25% outside air at 95F dry bulb and 75F wet bulb. The jacket of the new unit is finished in a green enamel with dark green ends to match the color of the Arco conditioner. The cooling coil can be used either with artesian well water or water artificially cooled.

MADE BY—*American Radiator Co., 40 W. 40th St., New York.*

Fedders Unit Coolers

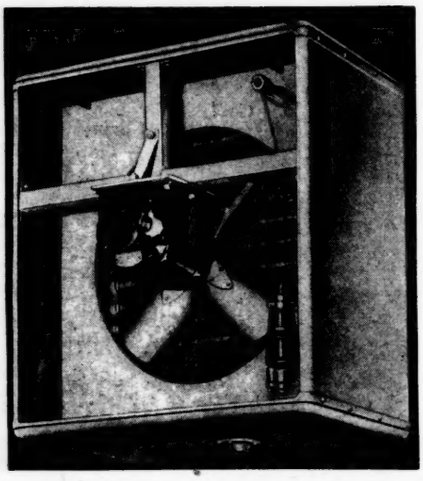
NAME AND MODEL NUMBER — Fedders unit coolers Series 73.

PURPOSE—For supplying cooled air for comfort cooling and commercial refrigeration.

FEATURES—Cooling element is made of seamless copper tubing with flat copper fins. The fins are arranged vertically to provide quick drainage of condensate. Inlet and outlet of all banks are manifolded in parallel by means of headers brazed to tubing. Cooling element is furnished with a silver satin finish. Fedders thermostatic expansion valves are standard equipment. Cabinet is made of permanent rust-proof metal with the bottom insulated to eliminate accumulation of condensate on the outside of the cabinet. A ½ in. pipe tap drain connection is provided for draining off the condensate. Adjustable louvres can be furnished as extra equipment when specified.

SIZE AND CAPACITIES—Available in 15 sizes with capacities ranging from 3330 to 9400 B.t.u. per hr. based on air inlet temperature, 38F, refrigerant inlet temperature, 14F and refrigerant outlet temperature, 34F. Capacities range from 11,250 to 32,900 B.t.u. under comfort cooling conditions 80° dry bulb, 67° wet bulb and 40° refrigerant.

MADE BY—*Fedders Mfg. Co., Buffalo, N. Y.*



Hexcel Portable Room Cooler

NAME—Hexcel portable room cooler.

PURPOSE—For room cooling utilizing chilled water.

FEATURES—Cooler has a four-blade fan which is capable of delivering 275 cu. ft. per min. at high speed. The water flow through the unit can be regulated from zero to 140 gal. per hr. Fan is driven by a two-speed motor using 47 watts. Unit is furnished in a brown crackle lacquer with brilliant chromium trim. Cooler is 54½ in. high, stands on a 17¾ in. base and weighs 80 lb.

MADE BY—*Hexcel Radiator Co., Racine, Wis.*

Carbondale Unit Air Conditioners

NAME—Carbondale unit air conditioners.

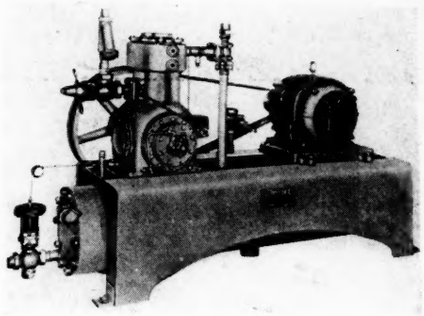
PURPOSE—For complete air conditioning including cooling, dehumidifying, cleaning, and air circulation.

FEATURES—Units are built on field-tested standardized designs. Each element is a complete and separable section in a compact cabinet. One section contains the complete fan assembly with motor, another the complete coil and humidifying assembly, and another the base and cleaning elements. Any section may be shipped or handled separately. All moving parts are readily accessible without dismantling the unit. The cabinet is constructed of heavy steel frames coated inside and out with waterproof and sweatproof insulation. The outside surface is finished in a rust-resisting enamel. Units are available with or without humidifying and heating elements. Four mounted horizontal suspended types are available.

LITERATURE AVAILABLE—Bulletin 1122.

CAPACITIES—300 to 11,000 c.f.m. with refrigeration capacities from 2 to 50 tons.

MADE BY—*Carbondale Div., Worthington Pump and Machinery Corp., Harrison, N. J.*



Reliance Condensing Units

NAME AND MODEL NUMBER—Reliance condensing units, type WAR 1500 and WAR 2000.

PURPOSE—Compressors and condensing units for air conditioning.

FEATURES—Compressor design permits use of Freon, methyl chloride, or ammonia refrigerants. Timken bearings. Forced feed lubrication. Rotary or double mechanical seal on stuffing box. Larger compressor valve area is provided by use of ring plate valves, made of special Swedish spring steel. Compressors have safety heads and water-cooled jackets. Shell and tube condenser, welded construction to avoid any possibility of leaks. Removable for cleaning.

SIZES AND CAPACITIES—1 hp. to 60 hp.

MADE BY—*Reliance Refrigerating Machine Co., Chicago, Ill.*

Automatic Products Solenoid Valve

NAME AND MODEL NUMBER—Solenoid valve, model 73-RB.

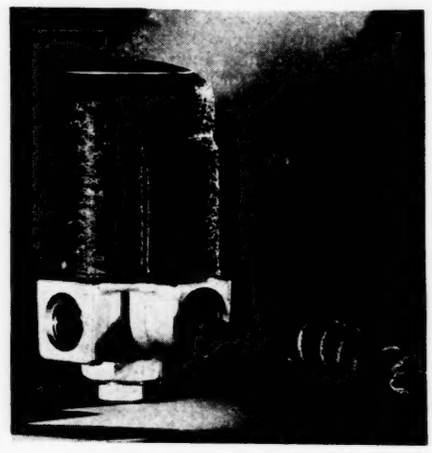
PURPOSE—For liquid and suction line control of Freon, methyl chloride and sulphur dioxide in refrigeration and air conditioning applications.

FEATURES—The manufacturer states that one of the outstanding features of construction is the removable seat assembly. By removing the bottom plug the seat can be unscrewed and both seat and needle assembly fall out for inspection and cleaning. It is said that it is never necessary to remove the valve from the line. Other features include a brass forged body, a non-magnetic steel alloy seat and stainless steel valve stem, completely sealed coil, impact type plunger and 38-in. lead-in wires.

SIZES—The valve is tapped to ⅜-in. pipe fitting.

LITERATURE AVAILABLE—Bulletin No. 401.

MADE BY—Automatic Products Co., Milwaukee, Wis.

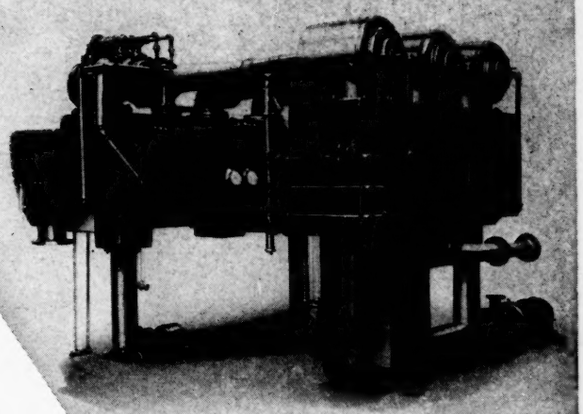


WATER-VAPOR REFRIGERATION
FOR AIR-CONDITIONING
Gives You EXTRA Advantages . . .

Ingersoll-Rand has developed refrigerating equipment differing basically from all previous practice to meet the severe requirements of modern air conditioning.

Consider these outstanding features:

- **Water is the only refrigerant**
- **Full capacity for life of unit**
- **Unusual overload capacity**
- **Flexibility—day by day**
- **Self-regulation with load**
- **Low operating cost**
- **Quiet and vibrationless**
- **Units may be installed wherever convenient. (One unit is operating on the 58th floor of a New York skyscraper)**



Steam-Jet Coolers

Steam-Jet Coolers which operate by means of steam-jet boosters, are easier to install and maintain than any other type of refrigerating equipment. No moving parts except pumps. Exclusive I-R features insure reliability and ease of operation.

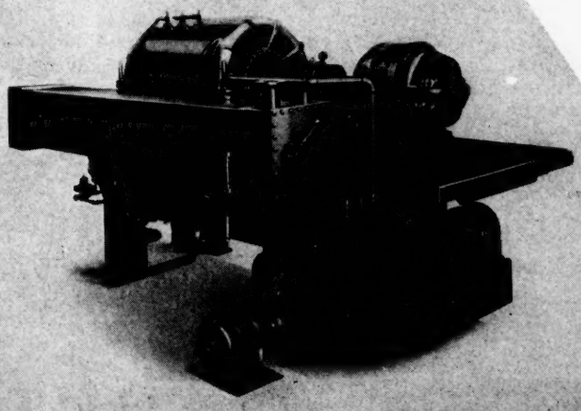
Capacities, 10 tons upward in standard sizes for any specified steam pressure 2 lbs. or higher. Bulletin 9143.

Centrifugal Type

The Centrifugal Water-Vapor compressor is driven by an electric motor or steam turbine, condensing or non-condensing.

I-R Centrifugal units are self-regulating; they float with the load, decreasing power consumption proportionately with reduced refrigeration demand.

Built in standard sizes for capacities of 100 tons refrigeration and upward. Bulletin 9144.



The use of water as the only refrigerant eliminates the leakage, storage and yearly replacement cost often encountered with systems using other refrigerants. Building owners are relieved from restrictive ordinances governing the use and storage of such refrigerants.

Ingersoll-Rand offers two types of Water-Vapor Refrigeration — Steam-Jet Cooler and Centrifugal—which permit the most advantageous selection of equipment to meet any conditions of steam or electric power, condensing water supply and refrigerating needs.

These units are widely used in industrial applications of cooling as well as in air conditioning service on land and sea.

Experience has proven that Water-Vapor Refrigeration brings mutual benefits to all concerned; the Architect and Consulting Engineer, the Contractor, the Owner, the Operating Personnel and the Occupants of the building.

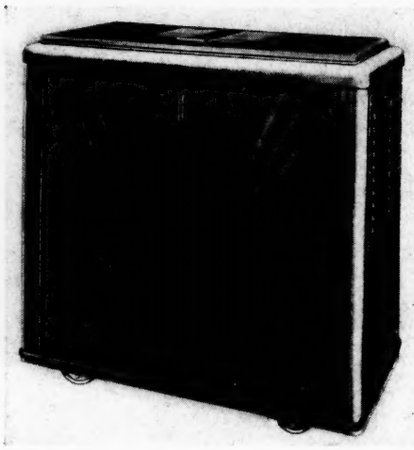
Insist that your contractor quote on I-R Water-Vapor Refrigeration.

Builders of Cameron Pumps, Condensers, Vacuum Pumps, Compressors, Blowers, Diesels, Rock Drills and Pneumatic Tools.

Atlanta, Birmingham, Boston, Buffalo, Butte, Chicago, Cleveland, Dallas, Denver, Detroit, Duluth, El Paso, Hartford, Houston, Kansas City, Knoxville, Los Angeles, Newark, New York, Philadelphia, Picher, Pittsburgh, Portland, Salt Lake City, San Francisco, Scranton, Seattle, St. Louis, Tulsa, Washington

Ingersoll-Rand

11 BROADWAY, NEW YORK CITY



Vitalaire Room Cooler

NAME—Vitalaire ice room cooler.

PURPOSE—For cooling using ice.

FEATURES—The unit is mounted on large rubber-tired casters and can be moved to any desired location where there is an electric outlet. This is the only connection needed. A blower draws the air from the room, circulates it through the unit, and discharges it back into the room. The melted ice water is caught in a pan and is emptied by rolling the unit to a sink and attaching a rubber hose and a water ejector to the water faucet. Connections are available for tapping into a permanent drain or steam and vapor system return. Fan has two speeds, discharging air at either 400 or 250 c.f.m. Maximum ice capacity, 300 lb.; approximate cooling capacity, 2000 cu. ft.

MADE BY—*Ice Cooling Appliance Corp., Morrison, Ill.*

General Refrigeration Evaporative Condenser

NAME—Hydro-Cyclonic condenser.

PURPOSE—For removing the heat from compressed refrigerant by vaporizing water.

FEATURES—Condenser is self-contained and includes a complete assembly of tank, condenser coil, motor fan, water lift, float control, and water valves. The condenser coil consists of a series of flat pancake coil sections installed in a circular tank and connected to a refrigerant inlet header on the outside end of the coil and a liquid outlet header on the inside end of the coil. Each coil section slopes downward, permitting the condenser refrigerant to drain from the tubes into the liquid outlet header.

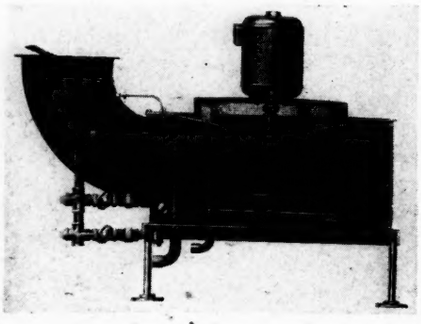
A vertical rubber-mounted enclosed motor is supported over the air inlet tunnel forming the top of the tank. A special fan with a conical water lift hub is directly attached to the bottom of the motor shaft extension.

METHOD OF OPERATION—Water from the bottom of the tank is raised by the water lift to the fan blades where it is mixed with the air passing through the fan. The spray is then propelled by centrifugal force over the hot refrigerant coils. Heat in the coils is transferred to the evaporating water and the moisture is carried off in the discharge air stream. Manufacturer states that it is not necessary to remove the coils to clean them as they can be completely submerged and flushed clean. Only one motor is used and no pump is required.

TYPES AND SIZES AVAILABLE—Three sizes, for use with methyl chloride and Freon with condensing capacities for compressors ranging from 15,000 to 120,000 B.t.u. per hr.

LITERATURE AVAILABLE—Form 214 and Specification Sheets EC-35, EC-70, and EC-90.

MADE BY—*General Refrigeration Sales Co., Beloit, Wis.*



Emerson-Electric Air Circulators

NAME—Emerson-Electric air circulators, 1937 model.

PURPOSE—For circulating air in offices, homes, and commercial establishments.

FEATURES—The 24- and 30-in., two-speed models for alternating current, and 24- and 30-in., one-speed models for direct current, are of an improved three-blade type with highly polished formed aluminum blades. The 24-in., one-speed model for alternating current has a four-blade fan. All types can be used with either style of mounting accessories, ceiling, wall bracket, counter or adjustable floor column.

SIZES—24 and 30 in.

MADE BY—*The Emerson Electric Mfg. Co., St. Louis, Mo.*

Herman Nelson Cooling Unit

NAME—Self-contained cooling unit.

PURPOSE—For comfort cooling in residences and offices.

FEATURES—Unit consists of a reciprocating compressor, water-cooled condenser, evaporator, fan and motor, all automatically controlled and housed in a compact, insulated cabinet. Two control knobs are located on the side of the cabinet, one knob controls the operation of the fan while the other provides an adjustment of the automatic thermostat for the degree of cooling desired. Cabinet is constructed of heavy gage furniture steel and is finished in an iridescent light tan baked enamel with a stainless steel trim. Unit can be located anywhere in the room. Requires electrical and water connections.

SIZES AND CAPACITIES—Manufactured in one size to provide ¾-ton cooling capacity with sensible heat rating of 6400 B.t.u. per hr. and a total rating of 9000 B.t.u. per hr. Air circulation is 360 c.f.m.

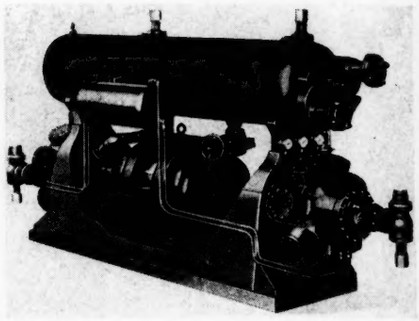
MADE BY—*Herman Nelson Corp., Moline, Ill.*

Airtemp Radial Compressor

NAME—Airtemp radial type air conditioning compressor.

PURPOSE—High speed refrigerating compressor for use with air conditioning systems.

FEATURES—Compressors are of the radial type and have either three, five, or seven cylinders placed in a circle around the crankshaft. They operate at a speed of 1750 r.p.m. The manufacturer states that this new type of compressor is light in weight, compact in size, and free from vibration. It is said that they can be installed in practically any part of the building because of their weight and vibration characteristics. It is stated that a floor which supports the compressors when standing still will also support them when they are operating at full speed. Large valve areas combined with small lifts are provided to give quiet valve operation. Auxiliary intake ports are provided at the bottom of each cylinder and these ports are opened by the piston itself as it completes each downward stroke. It is said that the use of the auxiliary ports accelerates intake and thus increases efficiency.



SIZES—From 10 to 75 hp. capacity.

MADE BY—*Airtemp, Inc., Dayton, Ohio.*

Strang Evaporative Condenser

NAME AND MODEL NUMBER—Strang evaporative condenser, series R.

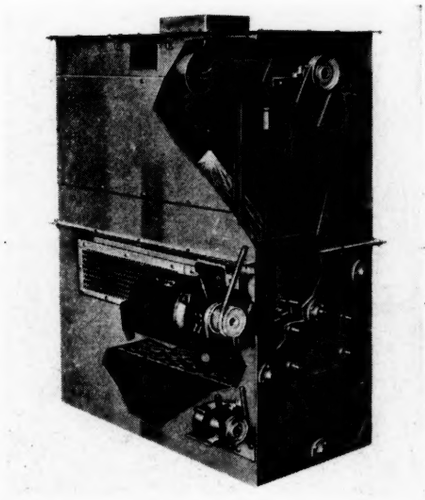
PURPOSE—For cooling condenser water for refrigerating machines.

FEATURES—Condenser is made in sections which are easily detachable to facilitate installation and handling without disturbing internal piping. The lower section is of heavy plate, electrically welded and protected internally by asphalt finish. The top sections are heavy gage black iron protected by aluminum finish and asphalt. The coils in the standard units are made of copper while in the ammonia units they are made of aluminum or steel. A separate motor is provided for the water pump and fan drive and the water pump is directly connected through a flexible coupling to its drive motor. The fan motor is connected through a V-belt drive to its motor. The liquid receiver can be mounted submerged in the water tank or external as desired. Filters for the air intake are available on all models. All models may be had weatherproofed for outdoor installation. When designed for outdoor use they include splash-proof motors, enclosure for V-belt drives and weatherproof enamel.

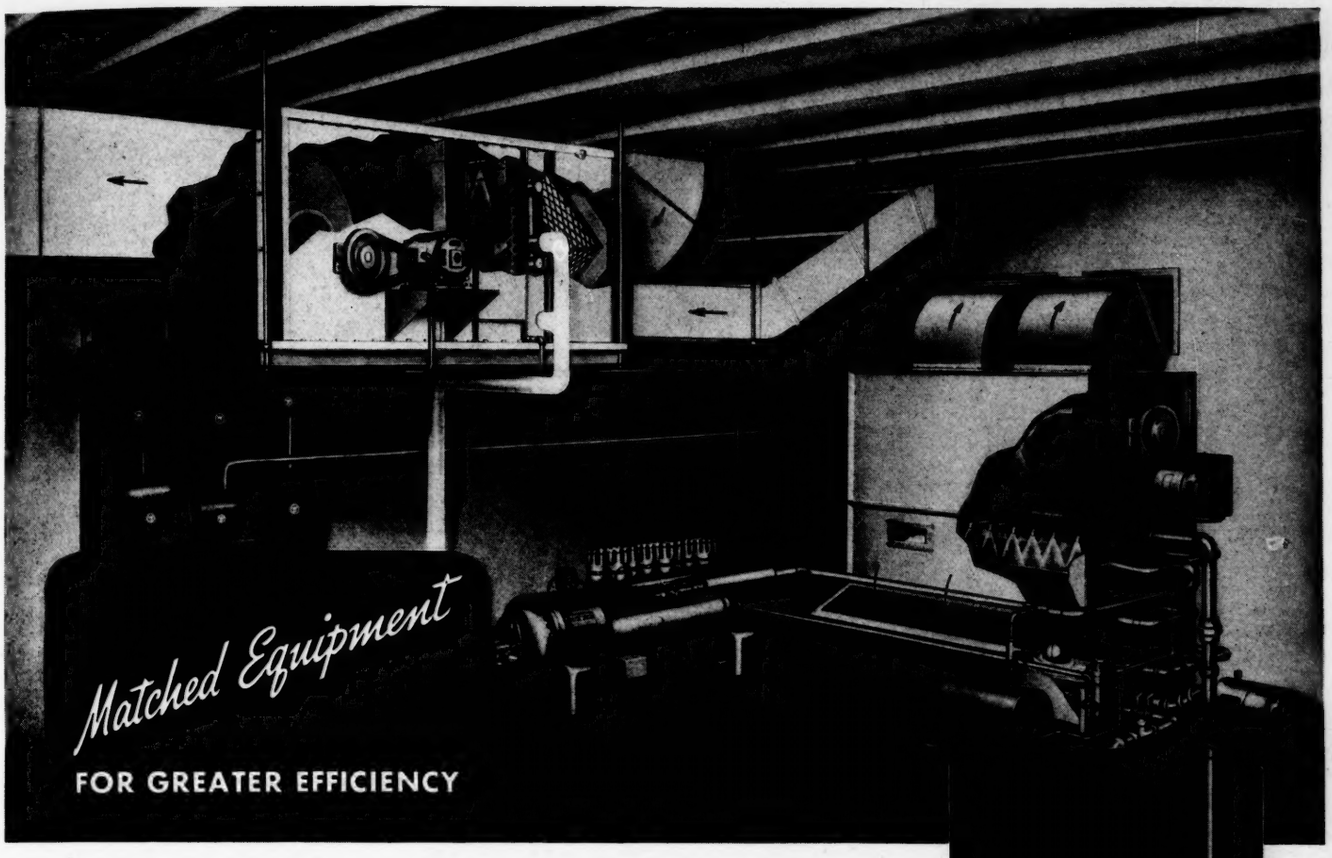
SIZES AND CAPACITIES—Available in 10 sizes ranging from 5 to 45 tons m.i.e. 24 hr.

LITERATURE AVAILABLE—Technical data bulletin series R.

MADE BY—*The Motor Equipment Co., Wichita, Kansas.*



ALL · WESTINGHOUSE



PROVED FOR PROFIT

Westinghouse Air Conditioning means ALL Westinghouse . . . Every unit of equipment is engineered by Westinghouse — *matched* in capacity and performance to operate in a *unified system* at minimum cost, in minimum floor space.

In short, the Westinghouse Air Conditioning System is a complete *System* — not merely an assembly of units.

UNDIVIDED RESPONSIBILITY

Application of Westinghouse Air Conditioning is made under the single *Undivided Responsibility* of the Westinghouse Authorized Engineering Contractor, embracing these three essentials:

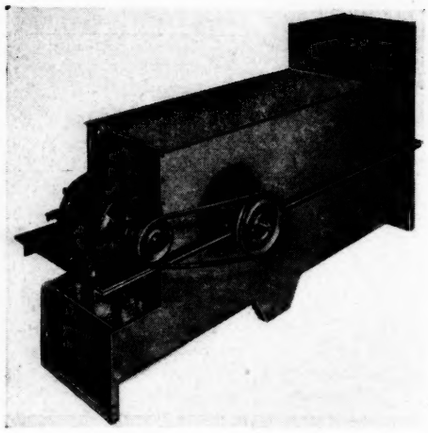
1. *Matched Equipment*, ALL engineered by Westinghouse.
2. *Engineered Application*, in a unified system to meet every characteristic and requirement of the job.
3. *Responsible Maintenance Service* for the assurance of continued efficient operation.

For full information on Westinghouse "proved-for-profit" air conditioning, write Dept. 837, Westinghouse Electric & Manufacturing Company, Mansfield, Ohio.

NEW!
A complete, self-contained, factory-engineered air conditioning system for small business spaces. Quick, simple installation.
Westinghouse UNITAIRE

Westinghouse *Air Conditioning*

BACKED BY THE "NAME THAT MEANS EVERYTHING IN ELECTRICITY"



Peerless Water Savers

NAME—Peerless water savers.

PURPOSE—Evaporative condensers for cooling water used for condensing purposes in refrigerating systems.

FEATURES — In the base of the unit is a water reservoir in which the height of the water is controlled by a float valve. The motor is mounted on the outside of the casing and is connected to a Helicon fan and an atomizing disc. This disc rotates at a high speed and picks up water from the reservoir. The fine vapor from the disc is sprayed over the coils through which the refrigerant flows. The entire coil and fan assembly is accessible for inspection and cleaning by removing the housing. An eliminator assembly is provided to prevent the discharge of any solid water. Motor is of the standard, splash-proof, horizontal type. Coil is of continuous, tinned copper tubing and can be used with any refrigerant except ammonia.

SIZES AVAILABLE—Eight sizes ranging from 1 ½ to 25 tons. Larger sizes made to order.

MADE BY—*Peerless of America, Inc., 515 W. 35th St., Chicago.*

Burnham Fan Cooler

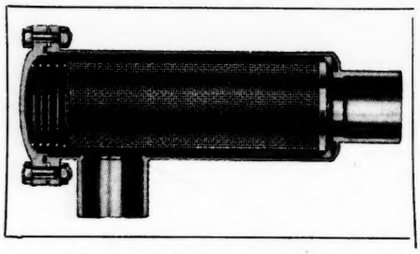
NAME—Burnham fan cooler.

PURPOSE—For supplying outside air to offices, hotels, restaurants and residences.

FEATURES—Fan is available as either a portable unit or a complete unit for attic cooling of residences. The attic cooling package includes a vent box with flame-proof trap door, ropes, pulleys and automatic fan switch. The vent box is made of panels of special sound-absorbing acoustical board set in slotted wooden frame. When the fan is not running the shutter closes the grille opening. The trap door is linked with the switch to start and stop fan. Fan starts when the trap door is opened and stops when it is closed. Illustration shows the portable floor model cooler.

SIZES AND CAPACITIES—Made in three sizes, 30 in., 7,000 c.f.m.; 39 in., 10,000 c.f.m.; and 45 in., 14,000 c.f.m.

MADE BY—*Burnham Boiler Corporation, Irvington, N. Y.*



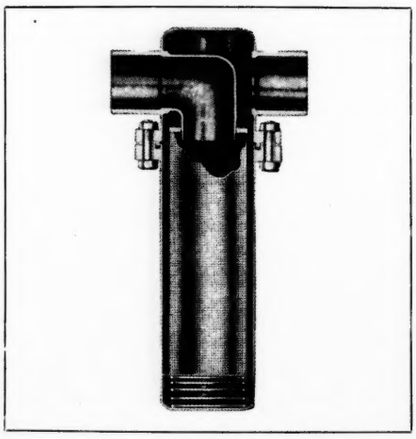
Type 866 refrigerant strainer.

Henry Refrigerant Strainers

NAME AND MODEL NUMBER—Henry refrigerant strainers, types 866 and 877.

PURPOSE—For removing grit and impurities from refrigerants.

FEATURES — Type 866 is an angle type strainer while type 877 is of the horizontal type. Both models can be cleaned without removing the strainer from the line. The spring tension provides a seal of screen against the inlet fitting. It is said that the angle type will not trap oil, while with the horizontal type oil trap can be minimized by installing the strainer on its side and keeping the inlet and outlet in a horizontal plane, or entirely prevented by installing the strainer so that the outlet is pointing upward or downward.



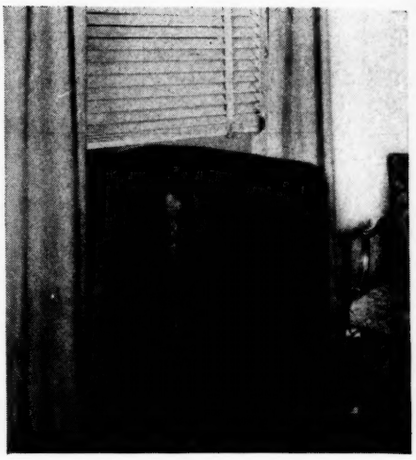
Type 877 refrigerant strainer.

Strainers are furnished with 100 mesh monel screen for liquid line, or 50 mesh monel screen for suction line. Both strainers are designed for use with copper pipe and the shell is built of flanged brass.

SIZES—Angle type, eight sizes from 5/8 to 2 5/8 O. D. size; horizontal type, five sizes from 5/8 to 1 3/8 O. D. size fitting.

LITERATURE AVAILABLE—Catalog 62.

MADE BY — *Henry Valve Co., 1001-19 N. Spaulding Ave., Chicago.*



Westinghouse Room Cooler

NAME—Window mounted room cooler.

PURPOSE—For cooling medium size offices and rooms.

FEATURES—Installation is very simple, it is only necessary to open the window of the room about half way, rest the unit on the sill, place the cabinet in position and plug the cord into the nearest wall socket. Other features are an hermetically-sealed condensing unit, compressor and motor cooled by refrigerant lines around the shell, air filters, and a ventilating damper for exhausting air from the room.

MADE BY—*Westinghouse Mfg. Co., E. Pittsburgh, Pa.*

Climax Air Conditioners

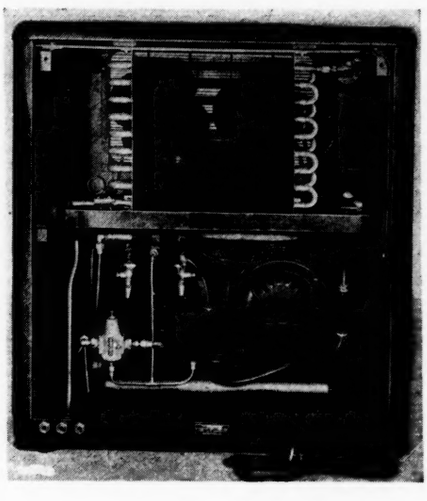
NAME AND MODEL NUMBER—Climax self-contained air conditioners, Nos. 20, 30, 40, and 50.

PURPOSE—For summer air conditioning.

FEATURES—Designed to cool, circulate, filter, dehumidify, and supply ozone. Equipped with a four-cylinder V-type compressor and an electric motor, both of which are water-cooled. Also cooled by water are a shell and finned type condenser and the compressor head. All models are housed in walnut cabinets which are insulated.

SIZES AVAILABLE—Four sizes with refrigerating capacities ranging from 3/10 to 1 1/10 ton and air circulation from 130 to 400 c.f.m.

MADE BY—*Climax Machinery Co., 121-153 E. Morris St., Indianapolis, Ind.*



SERVEL WAV MODELS

These heavy-duty four-cylinder machines include 15-ton and 20-ton models. They are designed for Summer air conditioning installations in large restaurants, shops, retail stores, hotels, and apartment buildings. They are available with either standard or evaporative condensers.

SERVEL WAO MODELS

These three-cylinder machines, with capacities of 4 to 6 tons, serve a broad field. They are ideal for smaller retail establishments, dress shops, shoe stores, drug stores, tea rooms, beauty parlors, etc. They are also adaptable for use in a multiple of offices or large homes.

Compact Units

These models provide especially high cooling capacity for the amount of space they require. Available in capacities from 1/3 to 3 or more tons, these models are ideal for self-contained units in which space is an important factor.

●

Special Models Built to Order

In addition to its regular line of machines, Servel builds special machine units or compressors for quantity purchasers whose requirements are not met by the 42 standard models.

Servel engineers will gladly assist equipment manufacturers and engineers in the designing or adaptation of special models and the proper balancing of evaporators and auxiliary apparatus.

The MOST VITAL LINK

in Every Summer Air Conditioning System

YOUR CUSTOMER is interested in all five functions of Summer air conditioning, to be sure, but he judges the job you sell by its output of *cooling* and *dehumidification.*

The power to cool and dehumidify rests primarily in the refrigerating machine you install. It must *perform!* It must *stand up!*

Scores of competent engineers employed by leading manufacturers, distributors and contractors in the air conditioning field have checked SERVEL refrigerating machines from every angle—design, material, methods, performance—and have given their unqualified "O. K."

Servel is glad to offer to the air conditioning industry in all of its phases, not only a fine line of refrigerating machines, but also the advice and assistance of Servel engineers, backed by more than fifteen years' experience in every phase of cooling.

Write today outlining your problems. Full details will be mailed, or a representative will call at your convenience. Address Servel, Inc., Electric Refrigeration and Air Conditioning Division, Evansville, Indiana.

SERVEL

REFRIGERATING MACHINES

Kool-Kleen Air Conditioners

NAME—Kool-Kleen air conditioner.

PURPOSE—For cooling rooms using ice.

FEATURES—It is said that the unit dehumidifies, washes, and recirculates the air by passing it through a refrigerated fog chamber. The second stage of cooling is obtained by passing the air over a solid cake of ice. The dust and foreign particles which are removed from the air are deposited on the eliminator plates which can be removed and cleaned. A control is provided to vary the amount of cooling or for shutting off the action of the fog chamber and air washer. The conditioner is equipped for three-speed operation. Included with the unit is a water pump and hose which is used to prepare it for re-icing. When new ice is added the free end of the hose is placed in a sink and the motor turned on. It is said that it takes just a few minutes to empty the water from the unit. The unit is portable and requires only an electrical connection.

SIZES—Made in two sizes, the No. 150 with an ice capacity of 150 lb. for rooms with approximately 150 to 200 sq. ft. of floor space; No. 300 has an ice capacity of 300 lb. for rooms between 200 and 300 sq. ft. of floor space.

MADE BY—*Kool-Kleen Air-Conditioning Co., Newton, Iowa.*

Norge Room Coolers

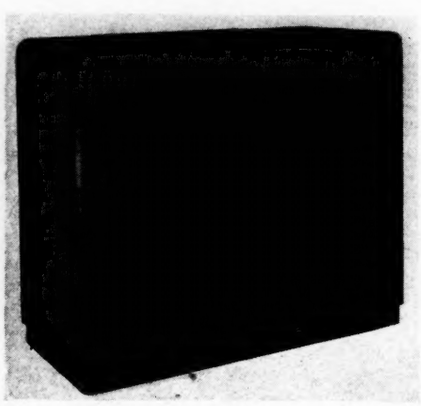
NAME—Portable room cooler.

PURPOSE—A portable unit for supplying cooled, dehumidified and clean air.

FEATURES—Room temperature air is continually drawn into the unit by electric fans, passed through filters and cooling coils and then delivered into the room. Refrigerant is circulated by a Rollator compressor through the cooling coils and is then boiled by the room air which passes over the outside of the coil. The compressed refrigerant is cooled by evaporation of water that is pumped and sprayed over the outside of the condensing coil. The rate of evaporation depends on the amount of moisture in the outside air. Cooling water is supplied by a 10 gal. tank which can be filled manually once each day or automatically through a ¼ in. copper flexible tube connected to a convenient water outlet. 200 c.f.m. of air is circulated by a double width centrifugal fan. Throw-away type filters are used for cleaning. A small slide damper is provided to permit a portion of the room air to be passed through the condensing system and passed outdoors. Cabinet construction is of heavy gage steel. Controls are located under a small flush lift door on top of the cabinet. Freon is used as a refrigerant.

SIZES AND CAPACITIES—45 in. wide x 40 in. high x 24 in. deep; ½ horsepower a.c. motor. Units also available for d.c.

MADE BY—*Norge Division Borg-Warner Corporation, Detroit, Mich.*

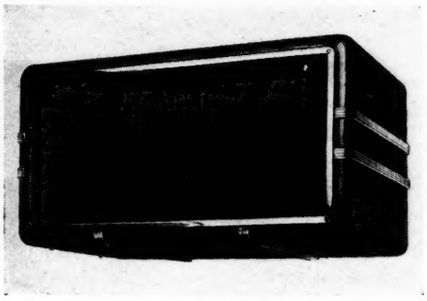


General Refrigeration Unit Coolers

NAME AND MODEL NUMBER—Unit coolers Models F116, M116, W116, F216, M216, and W216.

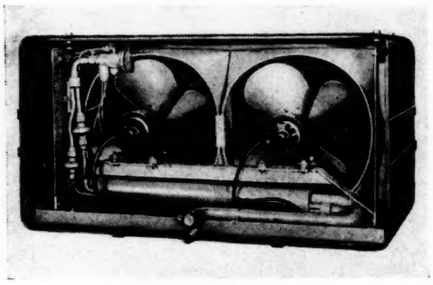
PURPOSE—For comfort cooling utilizing circulating cold water or direct expansion of Freon or methyl chloride.

FEATURES—Suspended type of propeller fan unit for cooling and dehumidification of air.



Front, Model 216

Unit has a metal casing finished in walnut brown with stainless steel trim and has a Uni-Flo grille furnished as standard equipment. Cooling coils are constructed of copper tubes with metallically bonded copper fins. F and M models are arranged for direct expansion of Freon and methyl chloride, respectively, while W models are for cold water. A heat interchanger is provided on the F and M models to increase the refrigerating capacity of the unit



Rear, Model 216

by sub-cooling the liquid and also to reduce suction line sweating by superheating the suction vapor. Thermostatic expansion valves and liquid strainer are provided on the F and M units. Fan motors have 6-ft. rubber sheathed conductor cord terminating in a two-prong attachment plug for electrical connection. The 116 models have a single motor and fan and deliver 600 c.f.m. while the 216 models have two fans delivering 1200 c.f.m.

MADE BY—*General Refrigeration Sales Co., Beloit, Wis.*

Airtemp Room Cooler

NAME—Airtemp room cooler.

PURPOSE—For cooling, ventilating, dehumidifying and circulating.

FEATURES — Unit incorporates Airtemp's newly developed radial type compressor. The compressor and electric motor are enclosed in one hermetically sealed housing to insure quietness. Vibration is said to be eliminated through special mountings for the motor compressor unit. Design incorporates principles of "floating power". Unit is available in both air cooled and water cooled models and is housed in a walnut cabinet.

MADE BY—*Airtemp, Inc., Dayton, Ohio.*

Viking Circoolator

NAME—Circoolator ventilating fan.

PURPOSE—For residential cooling by replacing warm summer air with cool outside air.

FEATURES—Unit consists of a fan and motor mounted in a cabinet finished in blue morocco enamel with silver stripes. The Helixoid fan which is used is said to be very silent. Fan is connected to the electric motor by a V-belt drive which is automatically kept tight by a self-adjusting base. The Circoolator can be installed by placing it next to a window or other opening. For homes having attics with no openings to the downstairs there is available a Circoolator attic unit which consists of a wooden grille for the ceiling and an air-tight vent box with all necessary fittings for the attic.

SIZES AND CAPACITIES — Available in three sizes—30, 39, and 45 in. having capacities of 7000, 10,000, and 14,000 c.f.m., respectively.

MADE BY—*Viking Air Conditioning Corp., Main & Center Sts., NW., Cleveland, Ohio.*

G-E Room Air Conditioner

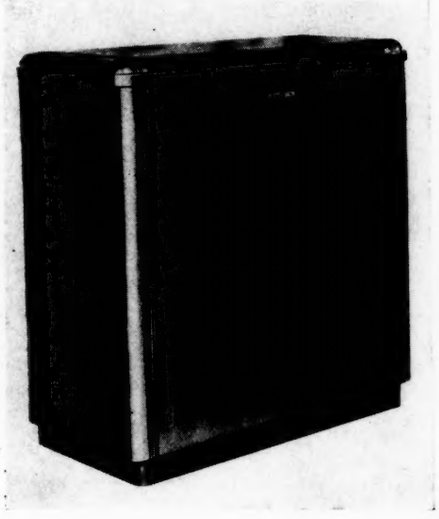
NAME AND MODEL NUMBER—Self-contained room conditioner, type AF-1.

PURPOSE—For summer room conditioning.

FEATURES—Unit is semi-portable and has a cooling capacity of about two-thirds of a ton. No drain or water connections are required. Unit is mounted next to a window and uses outside air to cool the refrigerant in the condenser. The hot air from the surface of the condenser absorbs the moisture condensed by the cooling coils and is discharged through the window. A drip pan covers the entire bottom of the unit. Forced ventilation of the air in the motor compressor compartment prevents heat and odors thrown off by the compressor and motor from entering the room. It is said that the operating cost of the unit is about 4c per hr. It is possible to increase the cooling capacity of the unit to about one ton by supplying a small amount of water through a small water line and making minor changes in the mechanism. This water is pumped over the condenser and cools the condenser by evaporation. A drain connection is not needed. The unit is enclosed in a burled walnut cabinet with slotted moldings. All controls are concealed.

SIZE—Approximately 41 in. long, 19 in. wide, and 44½ in. high; weight about 550 lb.

MADE BY—*General Electric Co., Air Conditioning Dept., Bloomfield, N. J.*



Ventilation and Air Conditioning for Health Occupy Limelight During Year

In this year-round section all considerations and discussions which are not readily identifiable as concerning either summer or winter plants are treated, as this method conforms to current practice.

Outstanding in the developments of 1937 were the steadily mounting importance of industrial dust problems together with the generally increasing use of fans in connection with equipment throughout the whole industry.

Aside from the detailed discussions of many of the problems given later in this section, mention should be made of the continued importance of sound prevention and control together with the problems brought about by the corrosion of metals. During the year several non-metallic materials for use in fabricating ducts made their appearance and their progress will be followed with interest.

Suitable standards for ventilation, the statement of which has been referred to American Standards Association, are still as desirable as ever but no reports appeared during the year indicating that a suitable statement concerning them was to be expected in the near future.

The problems encountered in the circulation and distribution of air through ducts and in rooms are among those pressing for solution. The ASHVE research program includes projects aimed at producing better technical information in connection with both of these but results from neither appeared during the year. As a result of laboratory investigations by ASHVE it is believed that the size of ducts considered necessary in residential work can be reduced substantially. Additional information on the question of what constitutes a draft is also anticipated from the laboratory.

Industrial Air Borne Diseases

Following the revival of interest in certain phases of the problem of silicosis in industry, which took place in 1936 (and was outlined and summarized in HEATING & VENTILATING, January, 1937, page 84), this general subject continued to receive attention during 1937.

Early in the year Air Hygiene Foundation outlined a research program, and by the year's end this organization had enrolled approximately two hundred important industrial organizations. The published program includes studies aimed at establishing the nature of silicosis, some of its effects on workers, effects of admixing other substances with silica dust as a preventive means, and the establishment of a definite X-ray technique for examination purposes. Included also are studies to obtain suitable hood design data for exhaust hoods for use in dust-producing processes. The program suggested suitable laboratories where the studies could be made and estimated the time required to complete them as from one to five years after their inauguration. In December it was announced that the Foundation had completed arrangements for having certain of these studies made at the Saranac Laboratory, the University of Pennsylvania, and the Harvard School of Public Health.

In New York the Industrial Board published rules, to be effective May 1, 1937, relating to the control of silica dust in rock drilling operations. This code divides all rock formations into two classes. Class 1 are those with less than 10% free silica, by weight, and Class 2 are those with more than 10% free silica. If drilling is done in Class 1 rock, dust counts must be below 100 million particles per cubic foot, and below 10 million particles if the rock falls in Class 2. Under this code dry drilling can only be used with local exhaust ventilation and adequate air cleaning. Wet drilling without ventilation will not result in adequate air cleanliness in the case of the high quartz or Class 2 rock. It is likely that other states will copy this code almost verbatim. It is also probable that essentially this same code will be adopted for dust exposures of all kinds. If this happens, the upper limit of dustiness in any kind of work, in any kind of dust will be 100 million particles per cubic foot.

During the year occupational disease amendments to existing Workmen's Compensation Laws are reported to have been enacted in six states, viz: Delaware, Indiana, Michigan, Pennsylvania, Ohio, and Washington, bringing up to 21 the states whose laws provide compensation for occupational diseases. State commissions have been appointed for the purpose of studying and recommending compensation in eight other states, viz: Alabama, Arizona, Georgia, Kansas, Maine, Maryland, New Mexico, and Oregon.

It has been known for a long time that certain substances seem to act to prevent the usual effects of silica dust in the lungs. Various investigators have studied these from time to time, and during the year several public announcements along this line were made. Emmons & Wilcox (see HEATING & VENTILATING, October, 1937, page 71) advanced the thesis that certain minerals, present in shale, exert a protective influence in an environment otherwise conducive to silicosis. As a result of experiments they selected three substances—carbon black, iron oxide, and alkaline earth carbonates—as being suitable for adding to a noxious siliceous dust and rendering it harmless. They did not report a detailed method of adding the protective dusts or devise apparatus for the purpose. No instances are known where these protective dusts have been used following these suggestions. Closely related is the work of Robson and Denny, who reported that in a Canadian mine they had been experimenting with aluminum dust. Their method apparently consisted of introducing aluminum dust into the siliceous dusty air present in the chambers of the mine. The method is promising

and continued efforts to attack the silica dust problem along these lines are to be expected. If they are successful, local exhaust ventilation will stand in a considerably altered position as a means of combating silicosis.

Other phases of the dust and noxious gas situations in industry continued to receive attention during the year. An association of foundrymen formulated a set of standards for exhaust ventilation to control certain foundry dusts and gases. Russian work on the limits of concentration in air of many industrial poisons was made available through a translation in English. American Standards Association continued its efforts looking toward establishment of standard specifications for exhaust hood design and air velocities. It is anticipated that these standards will necessarily have to be set up on a process basis. Preparatory to the establishment of these standards, committees are at work to draw up the threshold limits beyond which concentrations of gas, vapors, dusts, and similar substances become harmful in air. No reports of the progress of this work appeared during the year.

Effects of inhaling smoke from the combustion of coal were the subject of a paper appearing in a public health journal. While the studies were preliminary and were conducted on animals, a start has been made in securing definite values.

It can be stated that 1937 saw many of the problems of industrial dust and air pollution placed on a basis where the design and operating data should shortly be greatly amplified and be more logical and dependable than ever before.

Fire Protection Rules

In spite of the 1929 regulations on fire protection in the installation of air handling equipment having been overhauled and revised in 1936, further revision took place in 1937 when the National Fire Protection Association adopted new rules. These are now in three separate parts: one covering installations in residences, one for buildings other than residences, and one for blower and exhaust systems transporting flammable gas, vapors, or dusts. The new revision not only clarifies the regulations, but brings all such rules together (see HEATING & VENTILATING, July, 1937, page 53).

Odor Problems

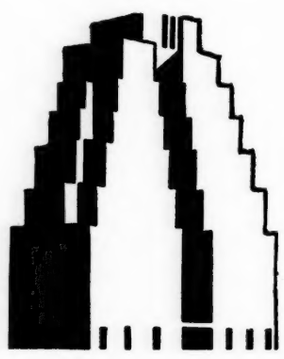
Presence of odors in air in buildings generally, and especially the odor problem where air is recirculated in comfort conditioning, came in for attention during 1937. Methods of handling the practical problem remain much the same as theretofore. With a unit available for adsorbing odorous substances by passing the odorous air across a bed of activated cocoanut shell carbon, there is now a means of reducing the odor concentration in used air to a point where a greater proportion can be recirculated than formerly. Dilution with outside non-odorous air is an alternate method but especially during the cooling season there is economic pressure to keep this dilution as low as possible. Ten cubic feet per person per minute where there is no specific odor-removing equipment in the recirculated air is the minimum still frequently used in comfort cooling generally. Just how far this can be reduced if there is effective odor removal equipment in the recirculated air stream is not yet determined.

Studies to learn the nature of odors encountered in comfort air conditioning, to develop effective measurement methods, and to establish more logically and positively the limitations of the elimination processes continue to be of interest because, while slow, such studies are gradually bringing to light the fundamentals of the odor problem. As for some years, the work of Yaglou at the Harvard School of Public Health is probably both the most advanced and the most comprehensive on the subject. Studies of the disappearance of odors from human-contaminated air in closed rooms are now in progress.

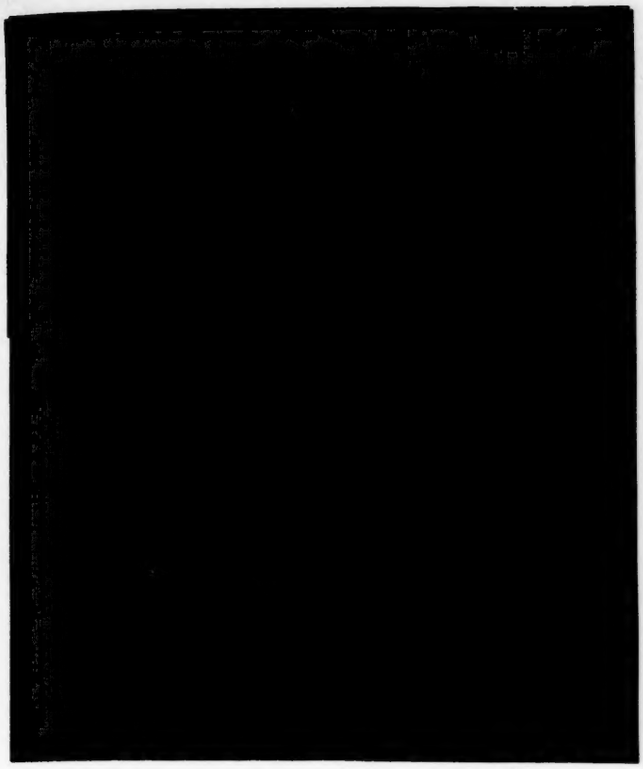
A method of determining the relative intensity of odors in air and permitting a chemical analysis to learn qualitatively and quantitatively the nature of the odorous substances in the air was described during the year by Gant and Shaw (see HEATING & VENTILATING, April, 1937, page 40). This method is novel and consists of passing a sample of the odorous air through a glass condensing tube kept cold by dry ice. Any vapors which condense at the gas temperature reached in the tube are deposited on a cold wire mounted in the tube. The substances are thus captured as solids and can be subjected to analysis. The method was developed for use in the testing of railway car air conditioning, but its field of application is not yet clear and neither are its limitations as a practical device in ordinary comfort air conditioning jobs.

Bacteria and Virus Problems

In the January, 1937, issue of HEATING & VENTILATING, reference was made (page 86) to the work of Dr. W. F. Wells and his associates in connection with bacterial and virus infection being air borne. Since that time the scope of these studies has been greatly extended and the findings have aroused wide interest. Doctor Wells has not only demonstrated that virus infections especially are air borne and persistent, but he has developed equipment whereby the killing-power of certain of the ultra-violet rays on these organisms can be determined quantitatively. It is suggested that his work makes it possible to set up a unit of "killing power" for bacterial sterilization essentially similar to "candlepower" in illumination, whereby a set of definite standards of performance may be established.



As an outgrowth of the work of Doctor Wells, a number of hospital operating rooms are equipped with ultra-violet lamps for sterilization. Methods of procedure are not standardized as yet and are still open to trial. One method concentrates the application close to the operating table and zone while another places the lamps further away. Still another method of sterilizing the air only is to place the lamps in the air circulation equipment and thus treat the air on its way to the room.



How the money spent for fans and blowers in 1937 was apportioned, by type

Another application of the ultra-violet sterilization method is in connection with the prevention of air borne cross-infection. Cases of this arise where isolation wards communicate with general wards or where special isolation hospitals contain isolation wards or sections for various diseases. Thus a children's hospital may have a measles section and a scarlet fever section. Prevention of cross-infection between the two sections is important. Reported applications have consisted of placing suitable ultra-violet lamps where they form a screen or barrier of rays across which all air and all other communication between the two sides must pass. The rays act to prevent infectious air or other material from passing without sterilization. Results from these installations are not reported as yet but are expected shortly.

Another phase of the bacteria-in-air problem is the condition present when a group of people are crowded together as in a theater and one of them injects an air borne virus into the air as by sneezing. Doctor Wells has demonstrated that in some cases such virus may persist suspended in the air for some time. There is some possibility of surrounding persons being infected. They are not fully protected against such a hazard by passing the room air over a bacteria-killing device located in the central air return or supply ducts. To what extent this is the real point of the problem has not been determined.

Introduction of a bacteria-killing agent into the spray water of an air handling system using a washer is also a possible method of attacking the bacteria problem. During the year, results of using benzylphenol for this purpose were reported (see HEATING & VENTILATING, March, 1937, page 40). Tests showed that in some installations it was possible to reduce the bacterial content of the air to one-sixth of that obtained when using plain water without treatment. This substance was also reported as helping to reduce slime found in spray water.

While there has been a fair amount of knowledge about the occurrence and nature of bacteria found in air inside and outside of buildings, a considerable addition was made when the results of an extensive air pollution survey of New York City were made public in 1937 (see HEATING & VENTILATING, June, 1937, page 40). It is noteworthy that the studies showed an apparent relationship between the type of room and degree of occupancy and the number of bacteria found. Also air conditioned theaters showed the smallest concentration of bacteria of all the building types studied, while schoolrooms showed the greatest concentration.

Hay Fever and Pollen Asthma

That suitable filtration of air will relieve many hay fever and asthma sufferers has been well established. During the year further confirmatory evidence was published. Professor Hodgson, as a result of his studies at Roosevelt Hospital, using a portable room cooler announced that in 7 to 10 hours of operation the equipment reduced the pollen count by 99%, and reduced it to two per square centimeter from over 1050. Pollen-free rooms are now fairly common in hospitals, while many private individuals also use room filters to make life comfortable during the worst season of the year. With the principle established, and with means of attack developed, active study is being continued on this general subject to such an extent that it is estimated that at least 150 physicians and chemists are at work on many particular phases.

Air Conditioning in Treating Disease

Aside from the use of air conditioning in hospital operating rooms, filtration for relieving hay fever and asthma, and similar adaptations already mentioned, there is a great deal of interest among physicians and medical practitioners, generally, in attempts to learn the possibilities of using conditioned air for the treatment of specific diseases. The rise in this interest has been rapid and has followed the general increase in public interest and the demonstration of what can be done with it in a few specific instances. This increase of interest was especially manifest during 1937. Evidence of it is shown by the fact that by the year's end, instead of only a few hospitals, laboratories, and independent investigators at work, it had become fairly general for specialists to pay close attention to the possibilities. In many cases this interest brought about installation of equipment where further studies could be made. Included among the institutions are the better known universities, several hospitals, clinics, and eminent practitioners. A list of the major groups is itself impressive and included pneumonia, heart conditions, allergy, eczema, obstetrics, pulmonary tuberculosis, gastro-intestinal, respiratory, arthritis, and venereal diseases. Now that interest is really live, there is every reason to expect that the possibilities of using conditioned air for these purposes will be thoroughly investigated. Naturally, progress is likely to be slow, however.

Special interest attaches to the artificial production of fevers as a treatment for various diseases. This

method of attack has been studied for some time, has been in use for a considerable period with gratifying and even spectacular results. Among the several ways in which fevers can be induced in the patient, heated dry air or heated humid air are but two. During the year a manufacturing concern made $50,000 available to the University of Pittsburgh for a three-year study of fever therapy. Results will be watched with much interest, and should continue to arrive in volume, as it is estimated that by the year's end two hundred workers throughout the country were studying fever therapy by physical means.

Methods of Joining Materials

Means of fastening and joining metal parts as used in construction of ducts, equipment, and piping, underwent no notable changes during the year. Welding and high temperature solders continued to be actively promoted, while fastening by means of screws and bolts also received the benefits of renewed interest. Handling techniques, training of operators, and development of methods of securing economy on the site of erection continued to be points on which much stress was placed. Substitution of shop for field operations continued both on the part of equipment manufacturers and on the part of contractors. Improvements and economies in fastening and erecting have steadily reduced the amount of erection labor required in the building. This is a development which has come on slowly but steadily and which has been made possible largely by the use of welding. To what extent it can eventually be carried is not predictable, but it is believed that in equipment for small residences, factory prefabrication has reached a point even now where the field installation labor has been reduced more than is the case with other mechanical equipment for residence use. In larger buildings the prefabrication tendency is far less marked and there is far less pressure for it.

The Noise Problem

Prevention of undue noise is an unending problem. Materials and methods have reached a state where there are abundant means with which to work, but detailed effective application still needs individual study. Testing and rating room equipment for its noise level continued on the course laid down in former years. Mounting of equipment on sound absorbent bases at the factory is now recognized good practice when justified. Floor, wall, or ceiling mounted room units now virtually always have sound absorbing or quieting materials incorporated. With the tendency toward greater air speeds in ducts and through distribution outlets, more and more care is being given to keeping down the noise. Several makers of sound absorbent materials have marketed definite designs for making ready use of these materials in air-carrying ducts. Quiet running belts and gears are considered essential in all equipment. Combustion equipment is now nearly always jacketed to cut down sound as well as to improve appearance.

Air Distribution

Practice in air distribution underwent no marked changes during the year. The advantages of using higher duct velocities and high outlet velocities are well appreciated, but there is no agreement yet as to how far to go in this direction. It is as important as ever that drafts be avoided, and many feel backward about increasing air speeds until fully satisfied that the result will not be disagreeable drafts. The present situation is similar to that which existed for so long a period when it was realized that steam pipe sizes could be reduced, but there was hesitation to change practice in this direction until more concrete information concerning the effects was at hand. Observation also points toward the conclusion that the existing data on the frictional resistance of metal ducts carrying air are not fully reliable, and this uncertainty adds to the unwillingness to change current practices.

Insulation and Heat Transmission

During the year technical interest in the behavior of building insulation under the conditions of actual use was revived. Most data assume that the material is installed dry and either remains dry during the peak period or else that any moisture present does not affect the design allowance made. There are much field data to support such a view. However, questions regarding the effects of moisture in building insulation have long been discussed with much difference of opinion about them. While these issues have not been so sharp as to change general practice, the year saw several laboratories undertake testing programs to study these effects further.

The data on which heat loads in buildings are computed are recognized as being open to question especially as regards the computation of summer loads. During the year steps were taken to remedy this situation but no results had appeared by the year's end.

Statistics

There has never been a great wealth of statistics published in connection with many of the equipment items used in performing the year-round functions. Because of this shortage of statistical information it has been impossible heretofore to give much consideration to the statistical position in the annual review. Conditions are not much improved in this respect now but included in this section are several tables and charts presenting what is available.

When over ten years ago the first industrial air conditioning unit was announced it was believed by many that these units would eventually displace central conditioning systems. This forecast has never been fulfilled and the central system continues to hold its own. Parenthetically, though, the unit conditioner has proved highly successful, in industrial applications particularly. So far as comfort plants are concerned it is interesting to note that central air conditioning system sales approximately doubled in 1937 as compared with 1936.

With such an increase in central systems an increase in air washer sales might be expected to follow and actually did—the increase being of the order of one-third.

For statistical purposes it would be not only convenient but of great interest to have data on the sales of air filters starting with, say, 1929. These devices,

being used in both central and unit type equipments and in connection with both summer and winter air conditioning, have become an essential part of any heating and air conditioning plant. It is too bad that data are not available prior to 1936 on sales of these devices, for the available figures indicate a 50% gain in 1937 as compared with 1936.

It seems odd now that twenty years ago heating and ventilating engineers spent considerable time discussing the heat transmission of steel pipe coils for hot blast heating and central air conditioning, for such coils have by now become practically obsolete. The total sales of these coils for central purposes for 1937 probably totaled less than $40,000, whereas sales of the newer forms of indirect heating surface, especially those using copper and aluminum, up almost 70% from last year, totaled well over two and one-half million dollars.

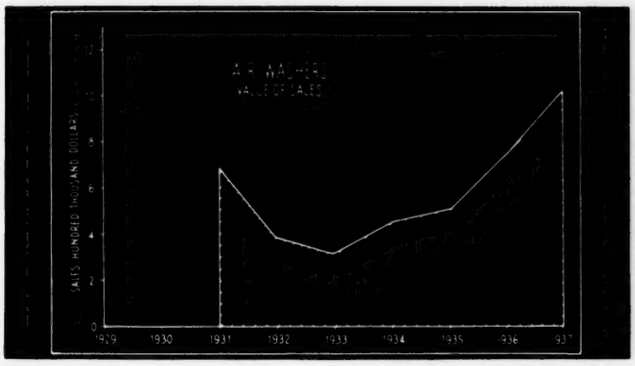
The total (since 1931) of fan and blower sales, including motors sold separately, is shown in one of the accompanying graphs. In addition, the pie chart (page 107) shows how these sales were divided up in 1937 among propeller fans, small housed blowers, large blowers for ventilating purposes and motors sold separately. The total fan business with which the heating and ventilating industry is concerned showed a 1937 increase of about 25%.

Detailed data are not available on many items of equipment used in heating, ventilating, and air conditioning plants and the sales of which total to imposing amounts. Among these are several products of the steel industry—steel and wrought iron pipe and sheets for ducts. Still another product with which the heating and ventilating engineer is concerned is building insulation. Sales of the various kinds of pipe are difficult to trace directly to specific classes of consumers and consequently such data are not presented here, although it is to be expected that sales of both pipe and sheet metal for ducts fluctuated roughly, as graph No. 6 shows in the front of this issue. Of the total sales of pipe to this industry brass and copper pipe constitute an appreciable percentage, but just how much is not known.

As the year ended, reports by one manufacturer of welding equipment indicated a notable increase in oxy-acetylene pipe welding in industrial piping. There is, however, no statistical support for the statement.

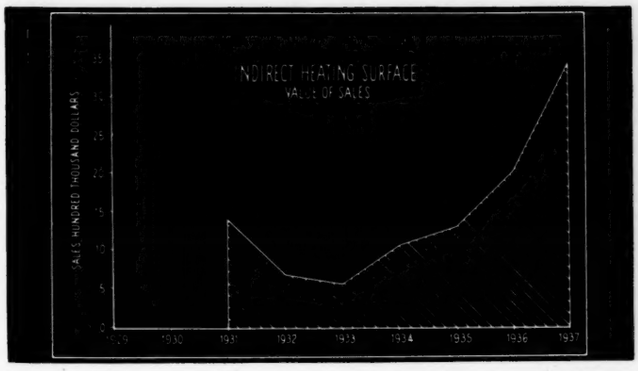
ANNUAL SALES

Sales figures for four major kinds of year-round equipment. Chart 29 includes all types of fans and blowers used for ventilating or heating purposes. Data are not available on other important year-round items, notably pipe, insulation, and sheet metal used by this industry. All of the data presented on these charts are for orders booked; consequently, when allowance is made for cancelled orders, these figures may be slightly high. This is probably offset by sales of manufacturers who do not report their volume of business.

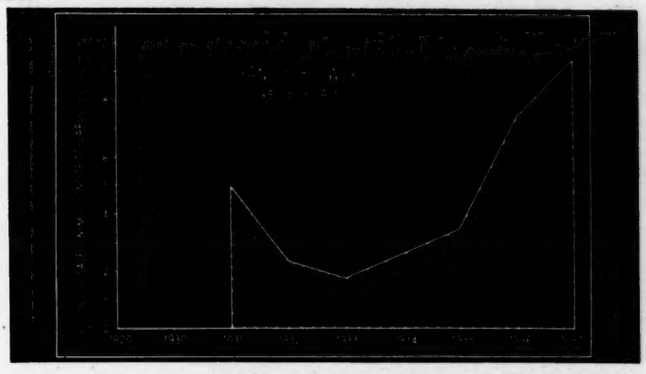


26 The value of sales of air washers as reported by a large number of manufacturers. The figures are in terms of orders booked. Data are not available prior to 1931.

27 The value of sales of air filters as reported by a number of manufacturers. Figures are in terms of orders booked. Data are not available prior to the year 1936.



28 Value of sales of indirect heating (and cooling) surface, including steel, cast iron, and non-ferrous types of surfaces. Figures are in terms of new orders booked.



29 The value of sales of fans and blowers, including fans used for ventilating public buildings, small housed blowers, propeller fans, and electric motors for fans and blowers sold separately.

MONTHLY EQUIPMENT SALES

YEAR ROUND EQUIPMENT

29 Blowers for Public Building Ventilation
Orders, Dollars

	1935	1936	1937
January	$60,571	$88,308	$130,765
February	29,181	105,753	134,643
March	73,023	178,453	199,413
April	112,226	195,756	287,135
May	109,330	160,342	212,237
June	111,716	135,831	197,762
July	81,218	139,386	138,423
August	64,883	140,345	168,248
September	67,322	133,362	135,137
October	62,889	147,963	110,867
November	136,496	128,935	—
December	90,836	103,770	—
TOTAL	$999,691	$1,658,204	—

30 Small Housed Blowers (Merchandise Units)
Orders, Dollars

	1935	1936	1937
January	$42,070	$104,708	$146,223
February	42,977	65,687	135,289
March	49,289	67,638	143,084
April	43,425	99,391	157,835
May	48,866	120,943	150,592
June	48,872	149,068	162,736
July	58,285	146,627	196,997
August	57,277	162,243	163,555
September	51,267	155,310	219,878
October	62,723	147,051	169,942
November	51,205	139,297	—
December	69,381	120,451	—
TOTAL	$625,637	$1,478,414	—

31 Propeller Type Fans, Ventilation
Orders, Dollars

	1935	1936	1937
January	$50,670	$77,359	$229,443
February	61,110	136,360	201,150
March	67,708	169,410	236,949
April	88,879	225,890	322,442
May	124,118	366,804	402,332
June	165,114	395,053	645,301
July	217,368	600,534	579,255
August	128,196	332,278	354,013
September	68,043	284,428	338,788
October	86,102	280,346	283,850
November	120,937	393,234	—
December	91,502	200,712	—
TOTAL	$1,269,747	$3,462,408	—

32 Fan and Blower Motors Sold Separately
Orders, Dollars

	1935	1936	1937
January	$42,762	$48,560	$73,546
February	45,210	55,926	59,870
March	37,447	69,849	90,046
April	43,505	84,274	176,566
May	37,679	63,324	85,010
June	67,137	80,639	112,380
July	35,645	85,248	90,032
August	44,739	72,293	64,240
September	41,281	62,102	66,162
October	43,873	132,074	68,776
November	112,485	78,577	—
December	55,583	61,567	—
TOTAL	$607,346	$894,433	—

33 Total Fan and Blower Business
Total, Tables 29-32, Incl.

	1935	1936	1937
January	$196,073	$318,935	$579,977
February	180,504	363,726	530,952
March	227,467	485,350	669,492
April	288,035	605,311	943,978
May	319,993	711,413	850,171
June	392,839	760,591	1,118,179
July	356,871	971,795	1,004,707
August	295,095	707,159	750,056
September	227,913	635,202	759,965
October	255,587	707,434	633,435
November	421,123	740,043	—
December	307,302	486,500	—
TOTAL	$3,502,421	$7,493,459	—

34 Indirect Heating Surface, All Types
Orders, Dollars

	1935	1936	1937
January	$84,990	$109,051	$257,136
February	70,571	132,484	221,426
March	79,811	168,426	352,549
April	133,057	174,488	395,064
May	112,367	135,247	247,610
June	114,657	158,860	266,111
July	96,023	158,440	229,144
August	139,843	167,752	274,340
September	102,879	177,748	247,885
October	119,163	170,874	163,432
November	129,981	229,952	—
December	117,626	234,873	—
TOTAL	$1,301,018	$2,018,195	—

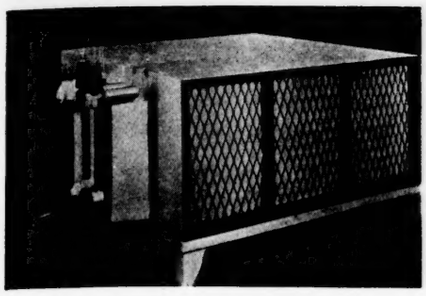
35 Air Washers for Central Systems
Orders, Dollars

	1935	1936	1937
January	$20,369	$39,357	$75,350
February	39,685	39,746	37,595
March	49,251	71,673	146,046
April	56,009	79,160	109,642
May	57,644	84,402	119,987
June	58,614	87,970	115,335
July	24,350	65,738	66,537
August	30,320	51,916	81,460
September	14,870	36,217	80,925
October	26,358	57,247	41,235
November	108,856	50,292	—
December	22,025	76,633	—
TOTAL	$508,351	$740,351	—

36 Air Filters, All Types
Orders, Dollars

	1935	1936	1937
January	—	$17,634	$16,302
February	—	15,213	20,747
March	—	43,701	34,542
April	—	19,137	53,388
May	—	21,363	38,673
June	—	12,430	41,290
July	—	11,648	37,185
August	—	11,531	32,937
September	—	14,952	42,841
October	—	23,745	36,815
November	—	9,795	—
December	—	9,294	—
TOTAL	—	$210,443	—

Year-Round PROGRESS Equipment



Fedders Unit Conditioners

NAME—Fedders "all-season" unit conditioners.

PURPOSE—For summer and winter air conditioning.

FEATURES—Conditioners are self-contained units, cataloged and delivered on a package basis for combined air filtering, cooling, heating and humidifying, or for heating or cooling only. They are shipped ready to install and coil surface is available for use with refrigerant, cold water, steam and hot water. Direct expansion coils are equipped with Fedders high capacity thermostatic expansion valves which are said to provide a sensitive adjustment and accurate refrigerant control in accordance with the varying temperature differentials encountered as the air passes through the coil. High efficiency centrifugal blowers driven by V-belts are used to supply large volumes of air. Humidification is by means of a self-cleaning nozzle which ejects a fog into the air stream. Operation of this humidifier can be controlled either manually or automatically. Fedders all-copper coil surface is used in the units. These coils are made of copper tubing and are tested with 3000 lb. pressure during fabrication and with 300 lb. air pressure after assembly. A filter section containing a double filter of the removable type is also provided.

CAPACITIES—Three to fifteen tons.

MADE BY—*Fedders Manufacturing Co., Inc., Buffalo, N. Y.*

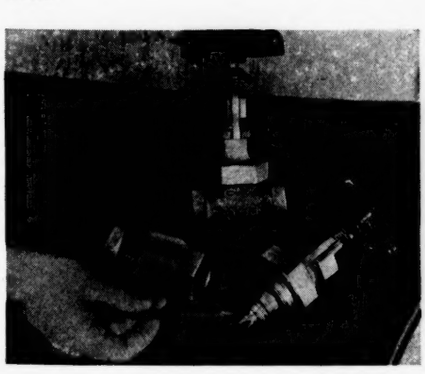
Hancock Valve

NAME—Hancock Flocontrol valve.

PURPOSE—A combination flow instrument and shutoff valve.

FEATURES—New line of valves retains the basic proportional flow or straight-line flow characteristics of the original valve. The valve seats and disks are made of superhard stainless steel with a hardness of 500 Brinell. The new Flocontrol valves have an entire new body of the Union Bonnet type.

MADE BY—*Hancock Valve Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn.*



Torrington Steel Blower Wheels

NAME—Torrington steel blower wheels.

PURPOSE—Small blower wheels for applications where an inexpensive small wheel is desired.

FEATURES—The manufacturer states that while the cost of these wheels will be less, they will be built to the same high quality standards as other Torrington wheels. They are made of pressed steel.

SIZES AVAILABLE—3 in. to 9 in. diameter in conventional standard widths.

MADE BY—*The Torrington Mfg. Co., Torrington, Conn.*

Young Damper Regulator

NAME—Valcalox damper regulator.

PURPOSE—For setting and indicating the position of dampers.

FEATURES—The manufacturer claims 12 points important to proper damper control. These are secure locking; no slipping of dampers; sleeve to receive bearing or bar; positive action; indication of damper position at all times; use with all styles of dampers; location on partition wall or any location of ducts; 360° rotation; elimination of corrosion through zinc alloy base; bearings permit easy installation of dampers in small ducts; wrench, bearing, screws and nuts cadmium plated; and bearing with pressed fit.

MADE BY—*Young Regulator Co., 4500 Euclid Ave., Cleveland, Ohio.*

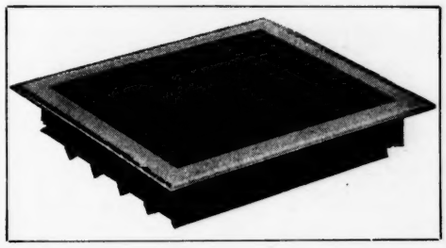
Pacific Air Circulator

NAME—Airvent.

PURPOSE—For window installation to supply filtered outside air and to eliminate street noises.

FEATURES—Filters in this unit are said to remove 98% of the dust from the outside air. The exterior of the cabinet is especially fitted to prevent rusting. Unit has two speeds and is capable of supplying 300 c.f.m.

MADE BY—*Pacific Mfg. Corp., 4223 W. Lake St., Chicago.*



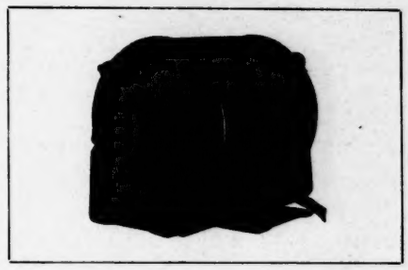
Auer Register

NAME—DuraBilt register and cold air faces.

PURPOSE—A register face with large air capacity and with meshes close enough to exclude small objects.

FEATURES—This new register face is of the steel cross-bar construction type, each cross-joint having a mortised and locked fit. Each cross-member is also locked to the frame by a hooked joint.

MADE BY—*The Auer Register Co., Cleveland, Ohio.*



Wagner Resilient-Mounted Motors

NAME—Wagner resilient mounting for motors.

PURPOSE—Annular resilient mountings for Wagner motors from ⅛ to 1 hp.

FEATURES—This type of mounting is said to have the advantage in that there is less vibration and less noise since the rubber mounting supports which absorb the vibrations are as close to the shaft center as possible. The large rings of rubber which support the motor are vulcanized to inner and outer steel rings. The motor base is made of rolled sheet steel and is shaped in the form of a cradle for supporting the motor. The motor can easily be removed from the base by loosening latch nuts and removing the latches.

AVAILABLE ON—Repulsion start induction, split-phase, capacitor and polyphase types of Wagner motors. Also available with belt-tightener bases.

MADE BY—*Wagner Electric Co., 6463 Plymouth Ave., St. Louis, Mo.*

Lovejoy Flexible Couplings

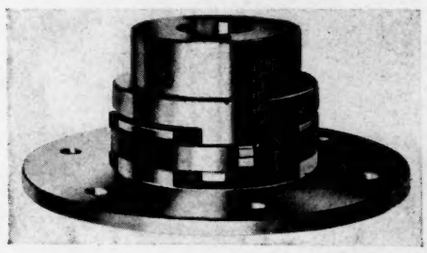
NAME AND MODEL NUMBER—L-R type WF flexible couplings.

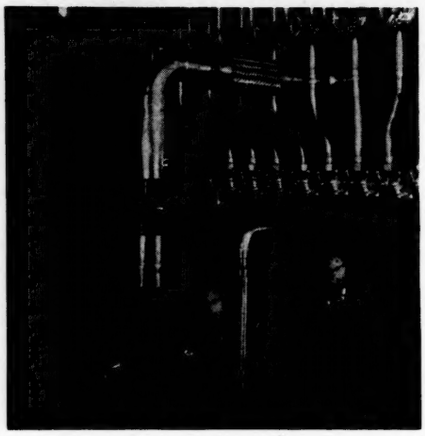
PURPOSE—For coupling motors and equipment where small space is available.

FEATURES—One of the bodies of the coupling is in the form of a flange which bolts onto the flywheel or clutch or brake drum of the motor. It is said that the flange body design reduces the overall length of this coupling by one-third. Free floating load cushions are held in place by a quickly removable outside retaining spring. Three types of resilient cushioning material are available for each of these couplings. One is metalflex for heavy shock loads; two, leather load cushions for sustained loads and greater misalignment; and three, multiflex cushions for use on fluctuating loads and where high resilience is required.

SIZES—From 3 in. to 14 in. bores, suitable for 2500 hp. at 100 r.p.m.

MADE BY—*Lovejoy Tool Works, 5022 W. Lake St., Chicago.*





American Vibration Eliminators

NAME—American vibration eliminators.

PURPOSE—To prevent the transmission of the noise and vibration from compressors or pumps through pipe lines to the building structure.

FEATURES—Vibration eliminators consist of a short section of flexible seamless bronze tubing with standard copper tube "slip fittings" welded on to both ends. The welding is said to be done at a temperature of over 1500F so that there is no possibility of weakness developing when the eliminator is soldered into the refrigerant line. The copper tube ends are designed to slip over standard makes of copper water tube or into standard solder fittings with just enough clearance to allow for a tight soldered joint.

SIZES—Available in either male or female connections, the sizes ranging from 3/16 to 3 in. and lengths from 5¼ to 60 in.

MADE BY—*American Brass Co., Waterbury, Conn.*

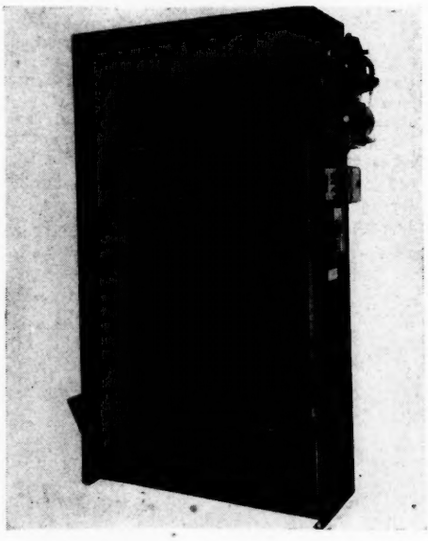
Unimatic Air Filter

NAME—Unimatic air filter.

PURPOSE—A self-cleaning air filter for smaller than average air volumes where hand crank or pushbutton control is practical.

FEATURES—The Unimatic filter is a self-cleaning unit filter with a filter curtain made up of a number of standard units. There are two additional units to those required to make up the curtain. One is submerged in the reservoir being cleaned and the other draining at the back of the filter.

METHOD OF OPERATION—Operation consists of raising the clean, drained unit to the top of the curtain and lifting the submerged unit to the draining position. This permits the bottom unit in the curtain to slip down into cleaning position. This change is made once a week or once a day, or as frequently as required by the size of the filter and dust load, to maintain uniform operating conditions.



SIZES AVAILABLE—Capacities from 1,000 to 30,000 c.f.m.

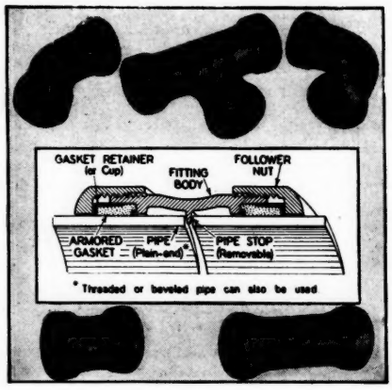
MADE BY—*American Air Filter Co., Inc., Louisville, Ky.*

Dresser Compression Pipe Fittings

NAME AND MODEL NUMBER—Dresser compression fittings, style 65.

PURPOSE — Self-contained pipe joints for tight and flexible connections on plain-end pipe.

FEATURES—The fitting comes completely assembled and can be installed by using only a wrench. Principles of operation are as follows: two threaded "follower" nuts when screwed up on the threaded body of the fitting, compress two resilient, rubber compound gaskets tightly around the pipe, thus sealing the joints. It is said that the specially compounded gaskets are made to last as long as the pipe itself and to retain their original resilience in service for many years. Each gasket is provided with flexible, metallic armor which protects the body of the gaskets from the contents of the line and makes a joint of high electrical conductivity. Although no special preparation of the pipe ends is necessary these fittings will take a threaded or beveled pipe. It is said that the fittings can be used on gas, water, oil, compressed air, chemical and industrial production pipe lines.



SIZES AVAILABLE—Standard length couplings for pipe sizes from ⅜ to 2 in.; extra long couplings, 45 ells, 90 ells, and tees for pipe sizes from ½ to 2 in. Adapters for providing "Dresser end" on various threaded fittings. Tee with a threaded branch for pipe sizes from ¾ to 2 in. Couplings, style 75, with the body internally threaded to take threaded-end pipe, and to act as an added protection against excessive thrust, pull or shock.

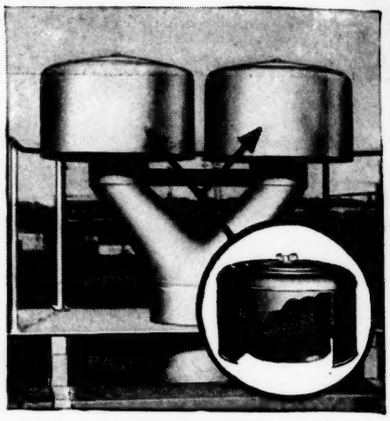
MADE BY—*S. R. Dresser Manufacturing Co., Bradford, Pa.*

Air-Maze Air Filter

NAME—Multimaze.

PURPOSE—An all-purpose filter for use with air conditioning installations, internal combustion engines, air compressors, and blowers.

FEATURES — The manufacturer states that for certain types of air conditioning installations the Multimaze units are more suitable than panel filters in that they take less space, are better protected against the weather, and are easily maintained. The Multimaze is a cleanable metal fabricated air filter. The air cleaning efficiency is claimed to be better than 99% with a pressure loss of less than ⅛ in. of water. Illustration shows a typical exterior multiple installation of two hooded units. Inset shows construction details.



SIZES AVAILABLE—For various sizes of internal combustion engines, air compressors, blowers, and air conditioning systems.

MADE BY—*Air-Maze Corp., 812 Huron Road, Cleveland, Ohio.*

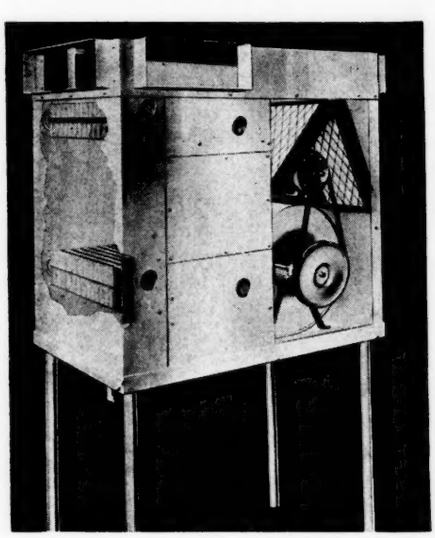
Waterfilm Universal Air Conditioner

NAME—Waterfilm Universal split air conditioner.

PURPOSE—For supplying humidified and cleaned air during the winter and cooled and cleaned air during the summer; for installation with either steam, vapor, or hot water heating systems.

FEATURES—Tempering coil, heated by hot water from boiler under waterline. During the winter this coil is always hot and will heat the air to 80F so that the fan can run continuously and never blow cold air. The humidifying system can be controlled manually or by a humidistat. A heating coil is also provided. With a steam system this heating coil is heated by steam and controlled by the burner. With a hot water system, the coil is controlled by a valve, pump and thermostat. During the summer the unit may be supplied with a complete mechanical cooling unit and cold water can be circulated through the heating and temperature coils.

MADE BY—*Waterfilm Boilers, Inc., 154 Ogden Ave., Jersey City, N. J.*



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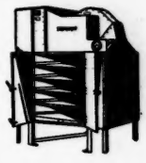

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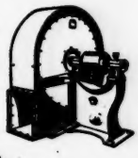

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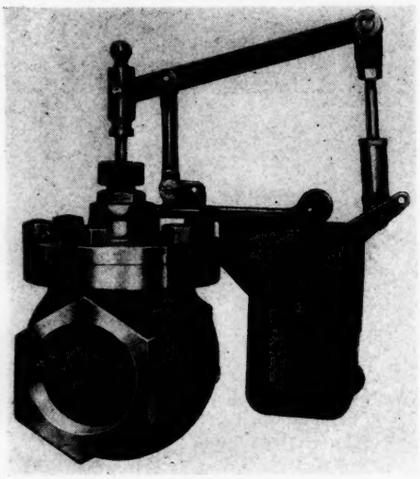


Automatic Motorized Valves

NAME—Automatic motorized valves.

PURPOSE—For controlling the flow of gases and liquids.

FEATURES—The motor unit is of the shaded pole reversing motor type with an integral transformer. Circuit operates on approximately 20 volts. Standard timing for all-on all-off control is 15 seconds, special timing can be furnished. For modulating operation motors must be used in conjunction with special relays; types RM1 or RM2 and modulating controllers.

TYPES AVAILABLE—Type VM1, single seated; VM1-2, double seated; type VM1-3, three-way; and type VPM1-1, pilot operated motorized valve.

MADE BY—*Automatic Temperature Control, Inc., 101 Park Ave., New York.*

American Multi-Panel Air Filter

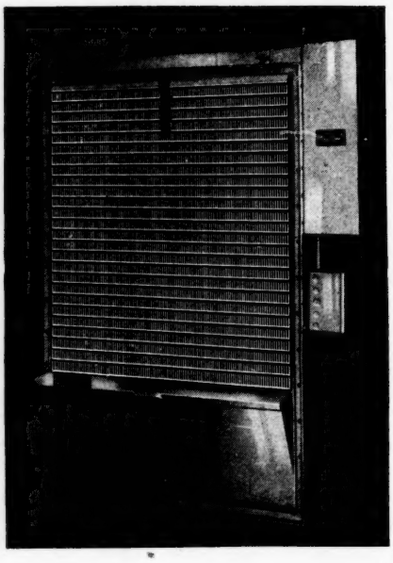
NAME—"Armored" multi-panel air filter.

PURPOSE—A special type of panel construction to provide three stages of air cleaning in a curtain type filter.

FEATURES—"Armored" panel is a combination of woven screen and a die-stamped louver section. The louver section consists of closely spaced vertical streamline-shaped baffles and forms the lower or exposed area of the panel. The upper part of the woven screen section which is at the back of the filter curtain is bakelite fiber coated to obtain high efficiency in the removal of fine dust particles from the air. The lower part of the screen section which lies immediately behind the "armored" section of the preceding panel is left uncoated to provide a second or intermediate stage of air cleaning. Lint and coarse granular dust are collected on the "armored" section of the filter curtain. The baffles have ample storage surface to handle a large quantity of bulky material without restricting the air flow, and being vertical permits this accumulation to be removed in the oil bath. The added weight of the "armored" section is said to improve the self-cleaning action by accelerating the movement of the panel through the oil bath. This actively forces the oil through screen section of the panel to obtain more positive removal of the dust accumulation. Now standard equipment on all multi-panel filters. Also interchangeable with former screen panels and any multi-panel now in service.

LITERATURE AVAILABLE—Bulletin 240-C.

MADE BY—*American Air Filter Co., Inc., Louisville, Ky.*



Armstrong-Corning Glass Insulation

NAME—Armstrong-Corning wool.

PURPOSE—A stitched blanket insulation of fibrous glass for hot water heaters and other equipment where the requirements are not severe.

FEATURES—The material is bats of Armstrong-Corning wool stitched between two layers of Kraft paper. It is said that this insulation is made from carefully selected inorganic materials and is fireproof, does not absorb moisture or fumes, is resistant to acids, and does not deteriorate.

SIZES AND TYPES—Available in three thicknesses, 1, 1½, and 2 in. and in three densities, also in sizes up to 9 by 50 ft.

MADE BY—*Armstrong Cork Co., Lancaster, Pa.*

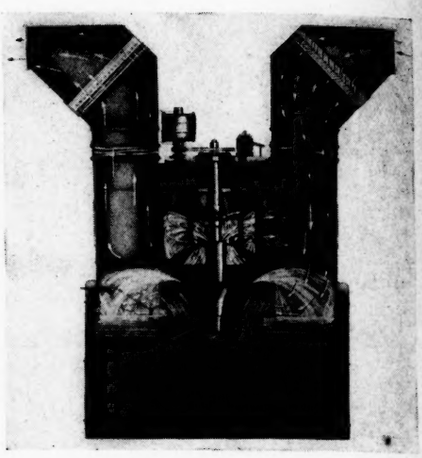
Utica Air Conditioner

NAME—Utica air conditioner.

PURPOSE—A conditioner for filtering and humidifying air with attachments available t make it a complete year-round conditioning unit.

FEATURES—The basic features of the unit are a Turbinator and Aqualute. The Turbinator is a device which throws two sprays of water. The first, a heavy spray to wash the air, and the second, a slow moving mist spray for a complete humidification treatment.

The Aqualute is a device which scrubs and slows down the air velocity and at the same time it is said to eliminate all entrained moisture. When the unit is used for heating, the discharge header connects with the cold air intake of a warm air furnace or if combined with a boiler, a heating coil of the correct size is placed in the header to heat the air passing through.



For summer, refrigerating cooling coils are hung partly submerged in the water pan and connected with a refrigerating compressor of the proper size. A super-cooling coil also in the same circuit is located at the discharge header. The sole purpose of the refrigerating cycle is to cool the spray water to 40 or 45F. A single power assembly, floating on rubber, drives the unit with a single ¼-hp. motor through interchangeable pulleys and V-belt. A standard throw-away filter is located in the intake header.

SIZES AND CAPACITIES — Four standard sizes with capacities ranging from 500 to 5400 c.f.m. with heating capacities from 7500 to 480,000 B.t.u., and cooling capacities from 1½ to 20 tons i.m.e.

MADE BY—*Utica Radiator Corp., Utica, N. Y.*

Chicago Pipe Vibration Absorbers

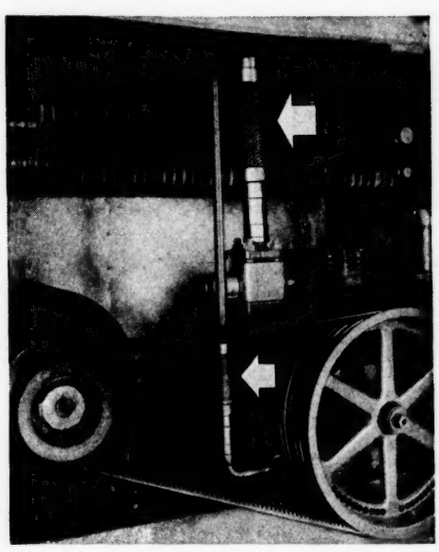
NAME AND MODEL NUMBER—Bronze vibration absorbers, RW-81.

PURPOSE—To prevent the transmission of vibration and noise from compressors into the building structure through the suction, discharge, or water lines of the compressor.

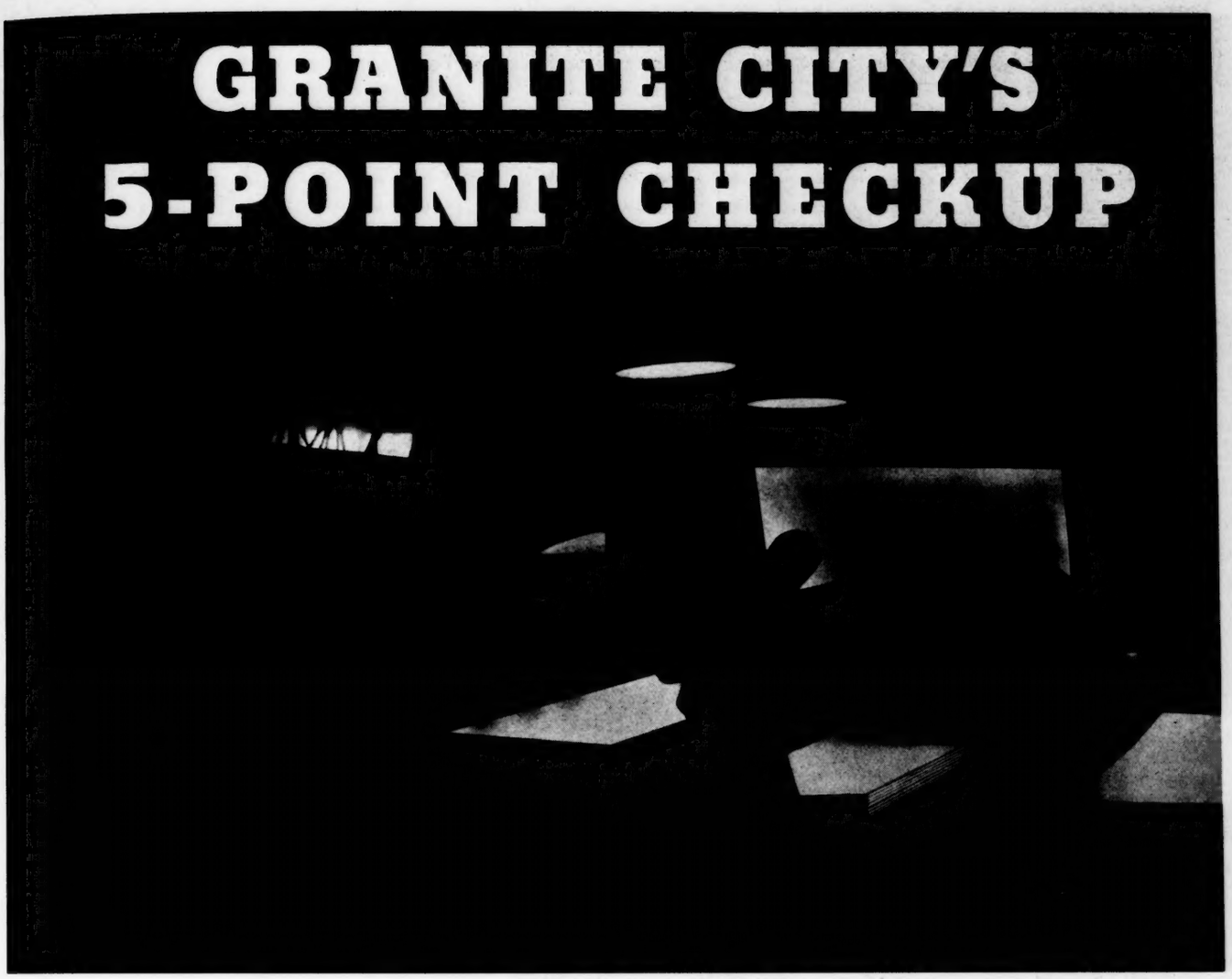
FEATURES—The flexible bronze used in these vibration absorbers is formed from strip metal into annular corrugations and welded. The absorbers are complete units with standard fittings which are attached to the compressor piping by brazing.

LITERATURE AVAILABLE—Bulletin RW-4.

MADE BY—*Chicago Tubing & Braiding Co., Maywood, Ill.*



GRANITE CITY'S 5-POINT CHECKUP



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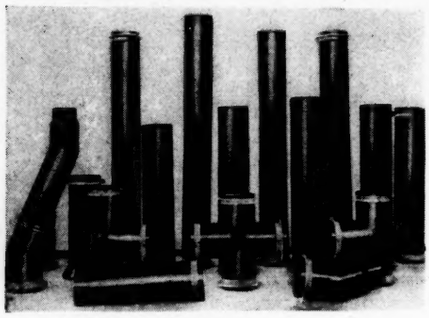


Haveg Fume Duct

NAME—Haveg fume duct.

PURPOSE—To resist corrosive fumes.

FEATURES—Haveg fume ducts are molded from a mixture of special acid-washed asbestos and a synthetic phenol formaldehyde resin. It is said that this duct is resistant to practically all acids and salts, to chlorine, to the weaker bases and many solvents and other chemicals. It is also claimed that the duct is not affected by rapid temperature changes and can be used continuously at temperatures as high as 265F without damage. The duct has a low thermal conductivity and it is normally unnecessary to insulate. Two types of fume ducts are available, one with a flanged end and the other with a bell end.

SIZES—Made in sizes from 2 to 30 in. and in standard lengths of 10 ft.

MADE BY—*Haveg Corp., Newark, Del.*

Walworth Bronze Valve

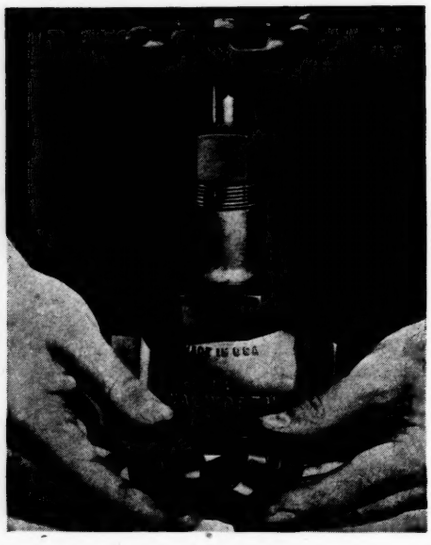
NAME—Walworth bronze valve.

PURPOSE—For general service on steam, air, oil, water, or gas lines where conditions are exceptionally severe.

FEATURES—This valve employs a seat ring and disk of special stainless steel with a minimum hardness of 500 Brinell. It is said that the non-corrosive disk and seat are hard enough to scratch glass. In actual service it is claimed that closing these valves on boiler scale or similar foreign particles will not damage them in any way. The handwheel is constructed of malleable iron and is of the air-cooled, non-heating type.

TYPES AND SIZES—Both globe and angle types and sizes from ¼ to 2 in. Valve ratings are at 350 lb. W.S.P. and at 550F.

MADE BY—*Walworth Co., New York.*



Wilson Welding Electrode

NAME AND MODEL NUMBER—Wilson welding electrode, No. 520.

PURPOSE—Electrode for use with small transformer type a.c. arc welders.

FEATURES—Manufacturer claims that this welding rod makes it easy to strike and maintain an arc when utilizing a.c. current for welding. It is said to work equally well on d.c. machines.

MADE BY—*Wilson Welder & Metals Co., 60 E. 42nd St., New York.*

Trane Packless Valve

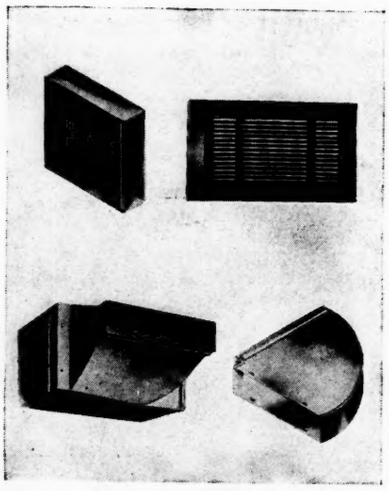
NAME—Trane hermetic radiator valve.

PURPOSE—A packless radiator valve without a bellows, designed for service on two-pipe vapor, vacuum, or steam heating system.

FEATURES—The valve proper receives its motion through a sealed diaphragm from a pressure button on the end of the valve stem. Movement of this diaphragm is said not to exceed 3/32 in. at any time. The operating mechanism of the valve utilizes multiplying levers to increase the travel of the diaphragm more than three times. The valve body is of cast brass with forged brass bonnets and collars.

TYPES AVAILABLE—Standard pattern with a wheel handle of bakelite. Other types available are key operated lock and shield pattern, lever handle or wheel and chain type for ceiling installations.

MADE BY—*Trane Co., La Crosse, Wis.*



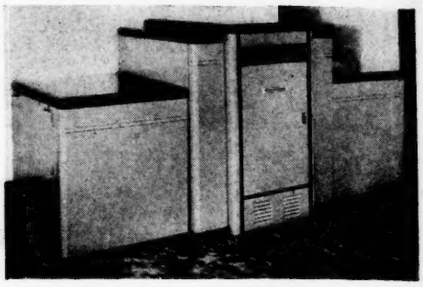
American Radiator Ducts

NAME—Prefabricated air ducts.

PURPOSE—To eliminate the necessity for sheet metal work to provide ducts for the company's air conditioning systems.

FEATURES—The prefabricated ducts, it is said, make it possible for a contractor to install one of the company's systems without any previous knowledge of sheet metal practice or without special tools to construct ducts for air delivery. Complete fittings and grilles are supplied with the mains for the installation. The units are manufactured with snap lock joints to insure air tight performance and to allow an easy fit and an interchangeability of parts. Manufacturer states that the variety of combinations possible with the air mains permits practically all job conditions to be met and any air distributing system to be installed.

MADE BY—*American Radiator Co., New York.*



Westinghouse Air Conditioning Unit

NAME—Westinghouse air conditioning unit; gas-fired (D Series), oil-fired (224 Series).

PURPOSE—For year 'round air conditioning using either gas or oil for heating and mechanical refrigeration equipment for cooling.

FEATURES—In the gas-fired units the burner radiator is constructed of No. 12 gage steel, while the drum of the heating element is made from boiler plate steel. All seams are welded after being riveted. The blower compartment is located at the rear of the burner compartment. The summer air conditioning compartment which houses the mechanical refrigerating equipment is attached to one side of the furnace compartment. Air is cooled by means of a cooling coil placed in the supply duct. The oil-fired air conditioning unit is similar to the gas-fired unit except that the blower compartment, like the cooling compartment, is mounted on the side of the heat compartment. Cabinets for both the oil- and gas-fired series are constructed of 20 gage cold rolled furniture stock and are finished with a glossy enamel.

SIZES AND CAPACITIES—Gas-fired model available in four sizes with capacity at register ranging from 107,000 B.t.u. to 267,000 B.t.u. per hr.

MADE BY—*Westinghouse Electric & Mfg. Co., Mansfield, Ohio.*

Taco Tankless Heater

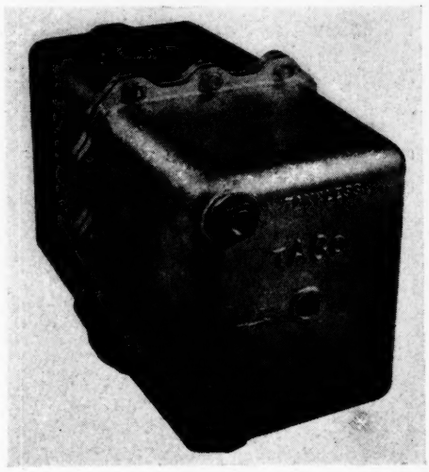
NAME AND MODEL NUMBER—External tankless heater No. 18.

PURPOSE—For supplying domestic hot water without use of a storage tank.

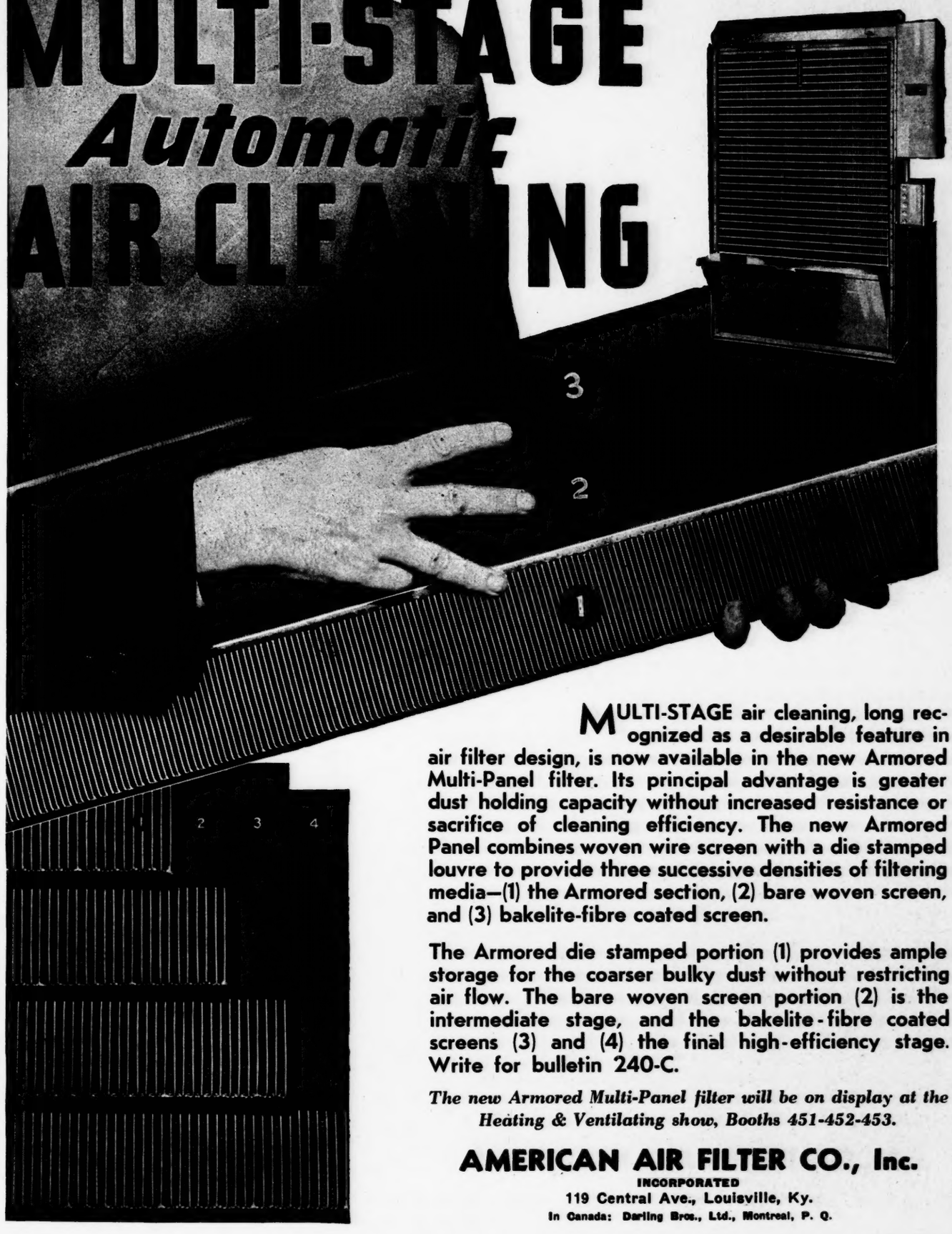
FEATURES—The shell of the heater is made of cast iron while the coils are of copper permanently expanded into bronze terminals. All waterways are of bronze or copper. Provision is made for draining the heater. When this heater is used for supplying hot water no storage tank is necessary.

CAPACITY—300 g.p.h.; 100F temperature rise using water at 180F.

MADE BY—*Taco Heaters, Inc., 342 Madison Ave., New York.*



FOR THE FIRST TIME MULTI-STAGE *Automatic* AIR CLEANING

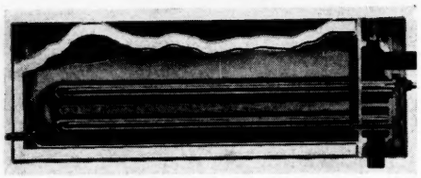


MULTI-STAGE air cleaning, long recognized as a desirable feature in air filter design, is now available in the new Armored Multi-Panel filter. Its principal advantage is greater dust holding capacity without increased resistance or sacrifice of cleaning efficiency. The new Armored Panel combines woven wire screen with a die stamped louvre to provide three successive densities of filtering media—(1) the Armored section, (2) bare woven screen, and (3) bakelite-fibre coated screen.

The Armored die stamped portion (1) provides ample storage for the coarser bulky dust without restricting air flow. The bare woven screen portion (2) is the intermediate stage, and the bakelite-fibre coated screens (3) and (4) the final high-efficiency stage. Write for bulletin 240-C.

The new Armored Multi-Panel filter will be on display at the Heating & Ventilating show, Booths 451-452-453.

AMERICAN AIR FILTER CO., Inc.
INCORPORATED
119 Central Ave., Louisville, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.



Bell & Gossett Water Heater

NAME—The Thermo-voir.

PURPOSE—A tankless heater for supplying domestic hot water using boiler water as a heat source.

FEATURES—The Thermo-voir is said to combine the best features of both tankless and storage hot water systems. In operation city water fills the outside reservoir after entering through the pipe to the lower left. Here it is heated by the boiler water which flows through the large inner pipes. When water is withdrawn the preheated water in the reservoir passes through two series of copper tubing before going to the fixtures. Thus the reservoir provides a reserve supply of hot water and the copper tubes act as instantaneous heaters. The manufacturer states that because the water stored in the reservoir absorbs heat from the boiler during off periods of the burner, there is no need for constantly maintaining the usual 160 to 180F boiler water temperature. Thus standby loss is reduced to a minimum.

TYPES AVAILABLE—Two models available, the DeLuxe constructed of non-ferrous metals and heavy air cell insulation, and the Standard with galvanized steel and no insulation.

MADE BY—*Bell & Gossett Co., 3000 Wallace St., Chicago, Ill.*

Pangborn Electrostatic Precipitator

NAME—Pangborn electrostatic precipitator.

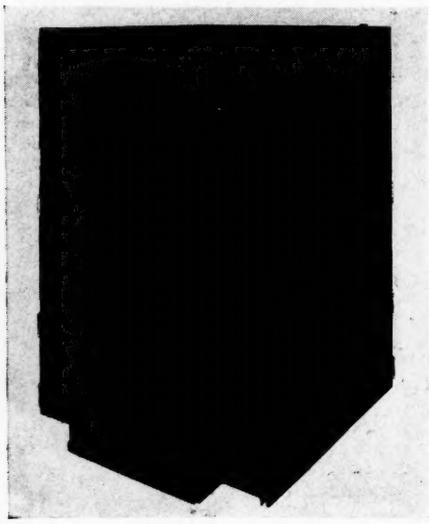
PURPOSE—An electrostatic precipitator for general and industrial air cleaning.

FEATURES—The manufacturer states that operating efficiencies as high as 99% (by weight) are possible and that the unit is particularly suitable for salvaging valuable dust, mass air cleaning, or for removing objectionable particles from gas or vapors. Precipitator consists of three essential parts: collector cells, ionizing assembly, and power pack.

OPERATION—Particles in the air are charged when they pass through the ionizing chamber and upon entering the precipitation chamber the electrostatic field between the plates exerts a force which drives the particles to the grounded plates where they are deposited. At necessary intervals these plates are cleaned by washing, rapping, or blowing with an air jet. The method of cleaning used depends upon local conditions.

LITERATURE AVAILABLE—Bulletin 904.

MADE BY—*Pangborn Corporation, Hagerstown, Md.*



Wagner Fan-Cooled Motor

NAME AND MODEL NUMBER—Totally-enclosed fan-cooled motors, type CP.

PURPOSE—For driving equipment which must be operated in atmospheres heavy laden with abrasive dusts, explosive dusts, corrosive gases, and extreme dampness.

FEATURES—This motor consists of a skeleton type stator, deeply grooved on the outside to increase radiation, which is provided with totally-enclosed ball bearing endplates with long machined fits to completely seal the working parts of the unit. An external blower mounted on the front end directs cooling air around the front endplate and over the corrugated surfaces and through a baffled back endplate down over the bearing. The movement of the air is directed over these surfaces by specially designed blower and frame shields.

MADE BY—*Wagner Electric Corp., St. Louis, Mo.*

ADSCO-Corning Insulation

NAME—ADSCO-Corning filler insulation.

PURPOSE—For the insulation of underground steam lines.

FEATURES—The insulation is composed of long flexible fibers of glass in a soft resilient mass resembling cotton batting but possessing the permanence and chemical characteristics inherent in glass. Heat conductivity is 0.33 B.t.u. per hr. at 4 lb. density. The material is said to fluff instead of settling under vibration. It is fireproof and unaffected by water, acid, or fumes. Can be used for pipe lines operating at temperatures of 650F or higher when required.

LITERATURE AVAILABLE—Bulletin No. 35-67.

MADE BY—*Corning Glass Works for the American District Steam Co., North Tonawanda, N. Y.*

Arco Air Conditioner

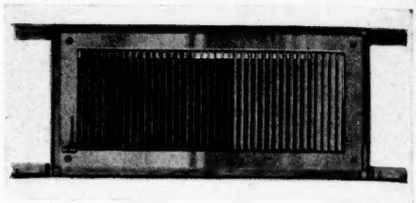
NAME AND MODEL NUMBER—Arco air conditioner series RH.

PURPOSE—For year-round air conditioning.

FEATURES—This conditioner is furnished for two general classes of applications, one for winter air conditioning and two, for conditioning during the summer season. For installations involving summer cooling and dehumidification, units are equipped with coils for either direct expanded refrigerants or chilled water service. The conditioner is assembled on a heavy steel base which serves also as a drip pan. Sides, top, and ends of the casing are formed of furniture steel. All units are equipped with a slow speed quiet operating fan with the bearings on the outside of the casing. Motors are also mounted outside the casing. Coils for either heating or cooling are of the finned tube type. The humidifier is of the self-cleaning impingement type. All units are equipped with filters which can be removed.

SIZES AND CAPACITIES—Four sizes with normal capacities ranging from 875 to 3500 c.f.m. and total heat output, using steam at 2-lb. pressure, from 75,500 to 256,000 B.t.u. per hr. Cooling capacities range from 21,000 to 65,000 B.t.u. per hr. using direct expanded Freon at 40F suction temperature.

MADE BY—*American Radiator Co., 40 West 40th St., New York.*



Hart & Cooley Adjustable Grille

NAME AND MODEL NUMBER—Adjustable deflection grille No. 84.

PURPOSE—For use with warm air heating or air conditioning systems to provide any desired distribution of air within the room.

FEATURES—The bars of the grille may be rotated through an arc of 90°; that is, 45° either way from straight. The bars of each 2-in. section are connected with each other so that if any bar in a section is turned all the bars in the entire section turn simultaneously. The link connecting the bars in each section is provided with a friction device which securely holds the bars in the position in which they are set but permits the bars to be readily turned for any desired deflection by means of a key. If desired, the bars may be permanently clamped in place by means of locking screws. Practically any directional flow setting may be obtained. It is said that the close spacing and the depth of the bars provides exceptional concealment of the duct without sacrificing free area.

MADE BY—*Hart & Cooley Mfg. Co., Holland, Mich.*

Electroaire Ozonator

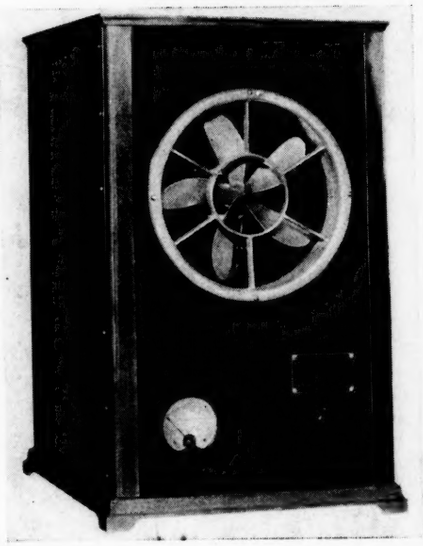
NAME AND MODEL NUMBER—Electroaire ozone generator, model FO.

PURPOSE—For generating ozone to destroy odors in rooms.

FEATURES—The manufacturer states that a marked improvement is the "Roto-Beem" circulator which is used in place of the ordinary fan. This patented air circulator is said to build up a spiraling air stream which sucks the air from all sides and from ceiling to floor, giving a faster and wider volume of air distribution and consequently a faster and greater distribution of ozone. The air stream is also given a pulsating action which is said to produce a pleasant effect on the occupant.

SIZES AND CAPACITIES—Two sizes, one capable of ozonating 8000 cu. ft. and the other 20,000 cu. ft.

MADE BY—*Electroaire Corp., 1455 W. Congress St., Chicago.*



A QUICK DIGEST OF ARMCO SHEET METALS FOR AIR CONDITIONING WORK

Whatever your sheet metal requirements for air conditioning, Armco can help you. Here you have access to a complete line of iron and steel sheets—a grade for every conceivable purpose. Visit the Armco exhibit at the Heating and Ventilating Exposition. See and hear about these many useful metals.

GALVANIZED ARMCO INGOT IRON

A highly refined iron developed by Armco more than thirty years ago. Use it for duct work, spray chambers, or wherever corrosive conditions are present.

ARMCO PAINTGRIP

A special galvanized sheet developed by Armco for painting upon installation. No acid etching or weathering. Definitely retards peeling or flaking of paint. Ideal for use where galvanized sheet metal work is exposed and the immediate beauty of paint is desirable.

ARMCO ZINCGRIP

An exclusive Armco product. Specify it for severely formed work requiring the protection of a heavy galvanized coating.

ARMCO ENAMELING IRON

Perfected by Armco. Known as "the world's standard enameling iron." Boiler jackets and ash-handling machinery are two popular uses.

ARMCO STAINLESS STEELS

A correct grade for every purpose, ranging from decorative trim to severe heat-resisting applications.

ARMCO INGOT IRON HOT ROLLED

Rolled on Armco-invented continuous mills. Has a clean smooth surface for such uses as fan blades, heating elements, fuel oil tanks, stoker hoppers and similar equipment.

COLD ROLLED

Sheets and strip. A custom-made product pioneered by Armco. Especially suitable for furnace and room cooler casings.

ARMCO H. T.-50

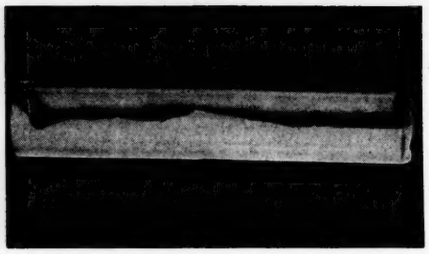
A low-alloy, high tensile sheet steel possessing great strength such as may be required in formed structural members. Armco H.T.-50 has four to six times the atmospheric corrosion resistance of ordinary steel.

Visit the Armco booth, number 69, at the Fifth International Heating and Ventilating Exposition. Grand Central Palace, New York City. January 24-28, 1938. Here you will see interesting exhibits of the metals we've briefly described and acquire much useful information on their applications.

*The new Armco Research Laboratories are the largest and most complete in the flat-rolled steel industry and staffed by men who have made many notable contributions to the development of better iron and steel sheets. They are always ready to assist you on special sheet metal problems.

The American Rolling Mill Co., Executive Offices: 10 Curtis St., Middletown, Ohio.

ARMCO SHEET METALS



Victor Copper Tanks

NAME—Victor seamless copper tank.

PURPOSE—Tanks for withstanding pressures from 85 to 150 lb.

FEATURES — These tanks are made by a process of electrical deposition. Each tank is one homogeneous piece of copper which is said to be uniform in thickness. The outlets are reinforced with hard copper "spuds" which are said to become an integral part of the tank during its formation by electrical deposition from electrolytically pure copper. All tanks are tested up to 300 lb. pressure under Massachusetts regulations.

SIZES—Made in a full line of sizes, extra heavy and double-extra heavy types for working pressures from 85 to 150 lb.

MADE BY—*Victor Mauck Seamless Copper Tank Co., Norristown, Pa.*

Illinois Reducing Valve

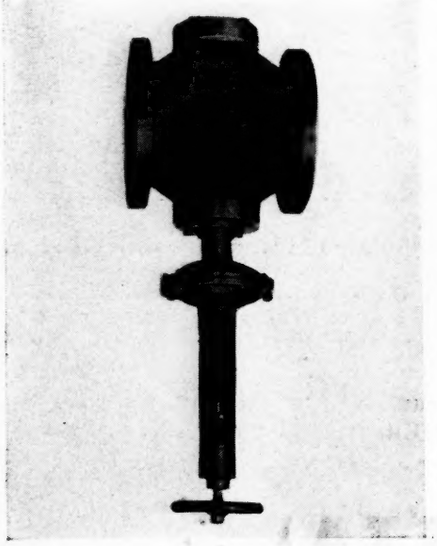
NAME AND MODEL NUMBER — Illinois reducing valve, Type M.

PURPOSE — To control the flow of steam through a full range of pressures from 10 lb. to as low as 28 in. of vacuum for low pressure heating and process work.

FEATURES—A spring attached to one side of the diaphragm on the low pressure side of the valve can be placed under tension or compression. An indicator shows the spring condition. Turning the handwheel at the bottom of the assembly adjusts the valve to control pressures above, at or below atmosphere. There are no stuffing boxes or sealing devices used and it is said that the valve instantly responds to slight variation in load. Diaphragm is said to maintain set pressure or vacuum on the delivery side of the valve under fluctuating inlet pressures. Diaphragm is made of composition or metal depending upon the conditions of use. Valve is made with iron body and a bronze trim.

SIZES—Up to 10 in.

MADE BY—*Illinois Engineering Co., Chicago, Ill.*



Ferro-Nil Water Conditioner

NAME—Ferro-Nil water conditioner.

PURPOSE—To prevent corrosion and failure of water circulating equipment by correcting acid condition of the circulated water used in air washers, cooling towers, condensers, and similar equipment.

FEATURES—A compact, simply operated feeder is installed on the water circulating pump and a special chemical solution is charged into the feeder daily. This solution is said to provide constant and uniform neutralization of the acidity resulting from acids picked up by the water from the washed air.

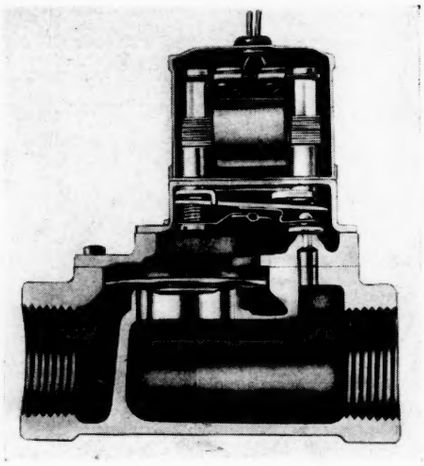
MADE BY—*Ferro-Nil Corp., 500 Fifth Ave., New York.*

Friez Magnetic Gas Valve

NAME—Magnetic gas valve.

PURPOSE—For controlling the flow of gas to boilers, furnaces, or stoves.

FEATURES—Main valve body is bronze, the floating disk is made of aluminum and valve seat of kid leather. External parts are cadmium plated and internal parts electrically tinned. The entire electrical mechanism and moving parts can be serviced without removing the valve from the pipe line.



METHOD OF OPERATION—Illustration shows valve in closed position. The incoming gas leaks through the clearance around the circumference of the disk filling the upper chamber with gas at line pressure. This pressure holds the disk firmly on its seat as there is only atmospheric pressure below the disk. When the control instrument through the electromagnet lifts the bleeder valve, the pressure above the disk is released to the downstream side. The incoming gas then lifts the floating disk to the top of the chamber and as long as the bleeder valve is open it is held up by the differential of pressure above and below the disk, by the impact pressure from the gas line, and by the wiping effect of the gas flowing around the edges of the floating disk. When the control is satisfied the electric circuit is broken and the relay closes the small bleeder valve. The flow momentarily continues around the circumference of the floating disk until the pressure in the chamber above the disk equals the line pressure. and the disk is then forced down on its seat. Closing process is said to occur in the fraction of a second. It should be noted that the bleed gas joins the downstream flow in the valve itself. Valves operate on 6 volt a.c. from 110 or 220 volt supply through suitable transformers designed for these valves. Electric consumption, 6 watts.

SIZES—Six sizes ranging from ¼ to 1¼ pipe size.

LITERATURE AVAILABLE—Bulletin No. VG.

MADE BY—*Julien P. Friez & Sons, Inc., Baltimore, Md.*

American Flexible Tubing Coupling

NAME — American Heatproof detachable coupling.

PURPOSE—A detachable coupling for use with American seamless flexible tubing.

FEATURES—Coupling is made in three parts: end nut, split ring, and top part. It is said that the coupling is extremely strong, has no rustable parts, and can be detached or reattached without the use of special tools. Either males or unions are available.

MADE BY—*The American Brass Co., The American Metal Hose Branch, 25 Broadway, New York.*

Bodine Flange Mounting Base

NAME—Bodine flange mounting base.

PURPOSE—Flange mounting makes it possible to mount the motor either horizontally or vertically with the shaft perpendicular to the mounting surface.

FEATURES—The type N-1 frame with which the new mounting is used is normally rated at 1/50 hp. but lower ratings can also be furnished. This motor can be supplied with all types of windings regularly supplied on fractional horsepower motors. Flange mounting is adaptable to either ball or sleeve motors.

MADE BY—*Bodine Electric Co., 2264 W. Ohio St., Chicago.*

Continental Air Cleaning Unit

NAME—Clean Air.

PURPOSE—Low-priced portable electric air cleaner for use in homes and offices.

FEATURES—Apparatus draws room air through a fiber filter and two sprays of water at a rate of 60 c.f.m. Included with the unit is a 1000-watt heating element which can be switched on or off if desired to supply warm air sufficient to take the chill off the room. Unit is 13 in. high, 10 in. wide, and weighs 10 lb. Holds from 4 to 5 qt. of water and utilizes either a.c. or d.c. motors. Price, $18.95 f.o.b. Detroit.

MADE BY—*Continental Motors Corp., Detroit, Mich.*

THEY'RE ALL PROSPECTS FOR DUST-STOP *Cleaned* AIR!

● Throughout industry and commerce, Owens-Illinois DUST-STOP Replacement-Type Air Filters are overwhelmingly preferred. Not alone because this amazing device removes from 96% to 98% of the dust and lint in the air passing through it, but because of its surprisingly low installation cost, long life, and ease and economy of replacement. And these are precisely the reasons why you can easily build a highly profitable replacement business on DUST-STOP Filters. Men work better in air that has been cleaned by DUST-STOP—the life of machinery is prolonged—merchandise in retail and wholesale stores stays fresher, more marketable—and the products of manufacture are better, more wholesome. These are facts which industry and commerce recognize. Because of these facts, coupled with the recognition and acceptance, a majority of the leaders in air-conditioning and ventilating standardize on DUST-STOP equipment for their units and systems. The coupon will bring you the story of how to capitalize on this outstanding preference. Mail it TODAY.

• • •

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DUSTOP

REPLACEMENT-TYPE

AIR FILTERS

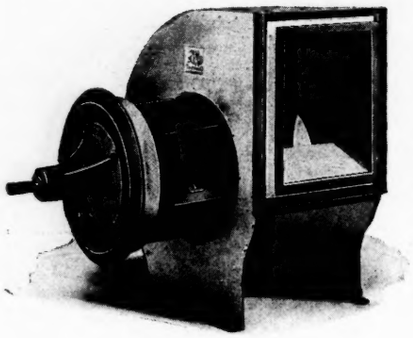
OWENS-ILLINOIS GLASS COMPANY
Industrial and Structural Products Division
304 Madison Avenue, Toledo, Ohio

Please send, without obligation on my part, complete information on the Dust-Stop Replacement-Type Air Filter.

*Name*_____

*Address*_____

*City*_____ *State*_____



Industrial Gas Engineering Exhauster

NAME—High temperature exhausters.

PURPOSE—For exhausting high temperature gases.

FEATURES—All parts subjected to high temperatures are fabricated of various heat resisting alloys best suited to the operating temperatures. Double row self-aligning ball bearings are used. These are kept cool by an air cooling method which is said to prevent the transmission of heat to the shaft, to the bearings, keeping the shaft cool and rigid and eliminating water cooling. Access to the exhauster wheels is provided, the complete assembly wheel, shaft and bearings being readily removable by the removal of cap screws which fasten the assembly to the exhauster housing. Exhausters are available in double housing, insulated and air cooled construction, also single housing uninsulated construction.

TYPES AVAILABLE—Exhausters are made in three stock classes; class L for operating temperatures up to 800F; class M for operating temperatures up to 1000F; and class H for operating temperatures up to 1250F. Special units can be furnished with exhausters for temperatures up to 1800F.

MADE BY—*Industrial Gas Engineering Co., Inc., 201-203 E. Ohio St., Chicago.*

Hexcel Cooling and Heating Units

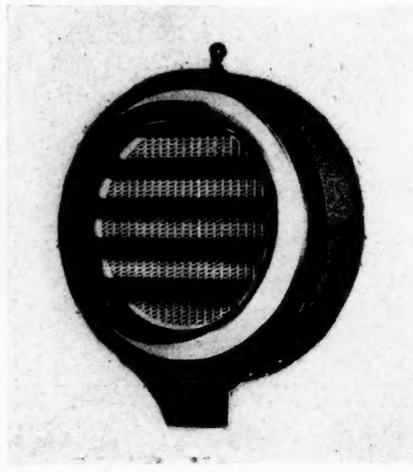
NAME AND MODEL NUMBER—Hexcel universal units, Models A and AA.

PURPOSE—For heating and cooling using low pressure steam or hot water for heating and cold water for cooling.

FEATURES—Unit is built in two types, a pedestal type for floor installations and a suspension type for ceiling installations. An all-copper core is used for the heat transfer surface and the tubes are brazed in heavy gage brass header plates with tanks drawn out of sheet brass. Directional rotating louver can be set at any angle, directing the hot or cold air in any direction desired. Units finished in brown crackle lacquer body with heavy bead of chromium. Air louver is ebony black. A two-speed motor gives either high or medium air delivery.

SIZES AND CAPACITIES—Model A unit gives a maximum air delivery of 334 c.f.m.; heat output, 32,600 B.t.u. per hr. For cooling 95F air with water at 55F, air temperature will be reduced to 71F. Model AA unit gives a maximum air delivery of 610 c.f.m.; heat output, 54,200 B.t.u. per hr. When cooling 95F air with water at 55F, air temperature will be reduced to 71F.

MADE BY—*Hexcel Radiator Co., Racine, Wis.*



American Coppercote Protective Coating

NAME—Coppercote.

PURPOSE—A waterproof, protective coating for preventing corrosion.

FEATURES—Coppercote is applied like a paint and is said to seal the surface with a flint-like sheathing of metallic copper. It is a liquid composition of fine atoms of pure metallic copper held in suspension in a vehicle which covers and seals the surface to which it is applied with a coating of pure metallic copper that is said to be rustproof, waterproof, and fire-resistant. The manufacturer states that it is particularly adaptable to the surfaces of air conditioning apparatus, such as the lining for spray chambers or drip pans where there is a continuous presence of moisture.

MADE BY—*American Coppercote, Inc., 480 Lexington Ave., New York.*

Horn Weatherstripping

NAME—Hornex rope.

PURPOSE—For weatherstripping casement or metal windows.

FEATURES—Hornex rope is made by mixing 1 part of Hornex paste and 1½ parts Hornex filler. This mixture is then pressed in an ordinary caulking gun and a long string or rope is extruded on to a dry dusty surface. The rope is allowed to dry for about 2 or 3 hours and is then ready for use. It is applied to the stationary member of a casement or pivot type window. Manufacturer states that Hornex is a very strong adhesive when tested against a direct pull. It is also said that this material will not dry up in the can or bottle and does not require heating before use. Can also be used for expansion joints in floors, walls, and roofs.

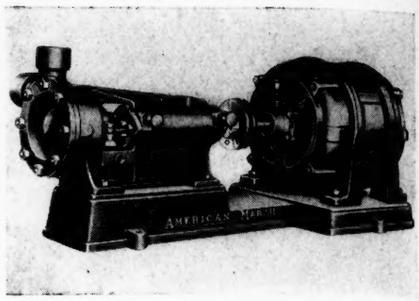
MADE BY—*A. C. Horn Co., Long Island City, N. Y.*

American-Marsh Turbine Pump

NAME—Type V turbine pump.

PURPOSE—A direct motor-driven pump for handling any non-viscous liquid which is free of abrasive matter.

FEATURES—There is only one moving part, a balanced impeller. The manufacturer states that unlike centrifugal pumps the Marsh turbine pump gives much higher heads for any given impeller diameter and speed and that the power required increases as the head decreases. It is said that the mechanical efficiencies are unusually high and that with small capacity pumping against high heads the pumps will give marked economy in power cost over centrifugal pumps. It is also said that when the turbine pump is directly connected to an electric motor or other prime mover of sufficient power to handle the maximum pressure, it cannot overload the driver should the pressure be less than estimated. It is stated that the turbine pump operates



successfully on suction lifts up to 28 ft. Pumps are designed for speeds up to 3500 r.p.m. and are built in single stage construction for pressures up to 175 lb. For higher pressures they are built in series or two-stage construction. Each pump comprises two main assemblies, one consists of the casing and all other parts which come in contact with the liquid handled and the other made up of the parts required for the mechanical operation of the entire unit. Interchangeability of several sizes of casings on each inboard head is provided for in the design. This is said to make possible quick and inexpensive replacement of any parts, minimum cost for special metal pumps and stand-by protection for merely the cost of three simple parts. The casing is of high-tensile cast iron while the impeller is of cast bronze with radial vanes cut to accurate dimensions on both sides of the periphery. Shaft is of stainless steel while the glands are of cast bronze.

LITERATURE AVAILABLE—Bulletin 450.

MADE BY—*American Steam Pump Co., Battle Creek, Mich.*

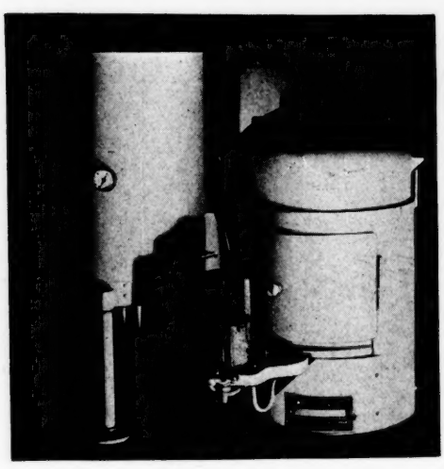
American Radiator Oil-Burning Water Heater

NAME—Ideal oil-burning water heater.

PURPOSE—For supplying domestic hot water, utilizing oil as a fuel.

FEATURES—Heater has a cast iron heating section with a steel combustion chamber insulated with rock wool. The burner shells of non-corrosive, stainless steel have no moving parts. An oil storage tank with a capacity of 8 gal. is provided as is a magnetically operated gage and Arco copper tubing to carry the oil from the tank to the heater. Heater is shipped completely assembled, and will operate automatically or manually on range oil or distillate. Large burner operates on a pound of oil per hour and the pilot normally consumes less than ¼ lb. per hr. Recommended for installation with a 40-gal.-per-hr. tank.

MADE BY—*American Radiator Co., 40 W. 40 St., New York.*



A Record Year for Control Equipment

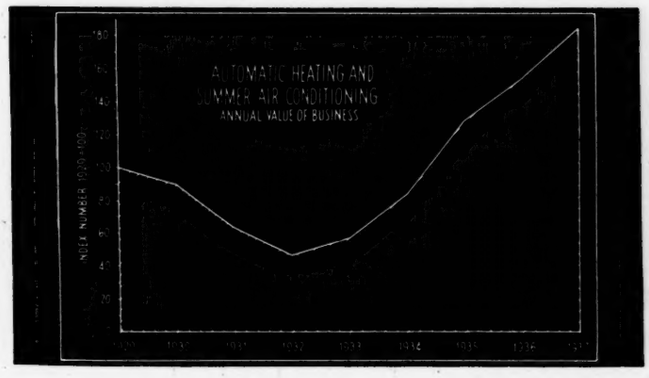
Throughout 1937 there was a revival of interest among manufacturers, for a number of firms who had not previously made controls and instruments in this field, brought products into the market.

To what extent these newcomers were attracted by the good volume of business available in the early part of 1937 or to what extent their entry was simply due to their development work having been finished in time to enter the field during 1937, there is no way of knowing at present. At any rate the business of supplying controls and instruments to this field is evidently attractive to many manufacturers of similar equipment.

Most of the equipment which appeared during the year represented revisions or redesigns. To some extent, however, special application equipment continued to appear. As has been true in several recent years there continued to be much interest in controls actuated by outside conditions or actuated by both outside and inside conditions. Increased attention was also paid to improved appearance on the items which are exposed in occupied quarters. A design by one manufacturer was awarded a prize for being an outstanding example of good appearance. Generally, the tendency toward central control could be noticed in the type of equipment which appeared. It seems hardly necessary to note in passing that trends of this kind have appeared before and that there is no reason to assume that the present tendency is necessarily permanent.

Statistics

There has never been any single index by which a year-by-year record of the trends in the volume of the control and instrument business could be kept. There is no central agency which collects and reports data showing the volume of sales. For this reason it has always been difficult to get any idea of the year-by-year advance in the sale of this kind of equipment. On this page is a graph showing the combined dollar volume of what might be called automatic heating equipment and all summer air conditioning equipment. While this is not a true index of the progress of the sale of instruments and controls, still it is undeniable that a very considerable amount of this equipment finds its market through being installed on automatically operated plants for winter use and on plants producing summer cooling. The curve is probably an ultra-conservative presentation of the facts, but even so it shows that during 1937 it is reasonable to believe that the instrument and the control business was nearly double that of 1929, and that it was nearly four times as great as during the depression year of 1932. While too much dependency should not be placed on the graph as indicating the true state of affairs in instruments and controls, it is believed that it may be useful, and it clearly brings out the fact that this kind of equipment has without doubt experienced the greatest increase in business of any class of equipment used in connection with heating, ventilating, and air conditioning.



30 **An estimate of the total annual value of business in automatic heating and summer air conditioning relative to 1929 = 100. This chart is presented with the idea that both of these businesses are relatively new in recent years and have a trend distinct from the straight winter heating.**

Controls & Instruments

Combustion Instruments

Examination of the record of new controls and instruments which appeared during the year reveals a number of instruments especially useful in checking, indicating or recording operating conditions in combustion equipment. Among these are several devised for the ready determination of the carbon dioxide content of flue gases, some of which are especially designed for convenient use for those who must get a quick check in the field without the ability to set up elaborate apparatus.

Hot Water Heating Controls

Notable also in the record of the year's new equipment are several controls for use with hot water heating systems. In devising such controls and placing them on the market, manufacturers of proprietary hot water heating systems are recognizing the desirability of incorporating automatic control as an integral part of their methods of heating.

One of the unusual devices brought out during the year is a mechanical means for computing the cubical contents of a room without the necessity of using the usual length yardsticks.

Examination of the record will also show the presence of a considerable number of timing devices, and these are indicative of the increased attention which is being given to time as a factor in the control of operations.

With control equipment being brought out so rapidly it is important that no device appear without taking notice of it. Because of the importance of instruments and controls generally in the successful operation of any kind of heating, ventilating, and air conditioning equipment it is especially urged that the record of the year's new equipment as presented in the following several pages be studied and preserved for future reference.